



**Washington State
Department of Transportation**

Transportation Building KF-01
Olympia, Washington 98504-5201
206 753-6005

CONFIDENTIAL
**Duane Berentson
Secretary of Transportation**

October 17, 1986

Mr. J. L. Sullivan
Location and Construction Engineer
Marine Division
80 Yesler way
Seattle, WA 98104

RE: Winslow and Kingston Ferry Terminals
Overhead Loading Facilities
Foundation Recommendations

Dear Mr. Sullivan:

This letter documents our foundation recommendations for the proposed new overhead loading facilities at both the Winslow and Kingston Ferry Terminals. The proposed construction is to consist of two pedestrian transfer bridge spans founded on two 54-inch diameter reinforced concrete shafts, and an elevator tower supported by 24 inch octagonal precast concrete piles.

The foundation recommendations herein are based on the specific project proposal detailed in an IDC and attached layouts dated July 16, 1986, and the site conditions encountered during the field explorations. The exploratory borings are assumed to be representative of the subsurface conditions throughout the project areas. If, during construction, subsurface conditions different from those found by the explorations are encountered, we should be advised so that we may assist you in reviewing these conditions and reevaluate our foundation recommendations.

FIELD INVESTIGATION

The field investigation consisted of reviewing two test holes drilled in 1976 and four test holes drilled in 1983 at the Winslow Ferry Terminal project site, as well as two test holes drilled in 1976 and four test holes drilled in 1985 at the Kingston Ferry Terminal project site. The location of the test holes in relationship to the proposed overhead loading structures are shown on Figures 1 and 2 for the Winslow and Kingston Ferry Terminals, respectively. Standard penetration tests were taken, in general, at 5-ft intervals. A total of 40 tests were performed in the test holes drilled in 1976 and 1983 at the Winslow project site, and a total of 42 tests were performed in the test holes drilled in 1976 and 1985 at the Kingston project site. Due to the very dense granular nature of the soil at both sites, no undisturbed samples were taken.

Copies of the test hole logs for both project sites are presented in Appendix A, detailing site specific conditions.

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At the Winslow terminal project site the foundation material, in general, consists of up to 4 ft of loose sand with shells, gravel and wood, underlain by approximately 6 ft of very dense sand, gravel and cobbles which in turn is underlain by very dense silty sand and sandy silt with gravel in places. Boulders and cobbles exist along the shoreline and should be expected in the soil units at this site.

At the Kingston terminal project site the foundation material is very similar to the Winslow project site. In general, the foundation material at the Kingston site consists of up to 5 ft of very loose to loose, organic, silty sand and gravel with shells and wood, underlain by very dense silty sand and silty sandy gravel. A 5 ft layer of silty sand and gravel containing cobbles and boulders was encountered 4 ft beneath the loose surface material in test hole H-2, located near the proposed elevator tower. Cobbles and boulders can be expected to exist in any of the foundation material at this site.

LABORATORY TESTING

The laboratory program consisted of the identification and classification of disturbed samples obtained from the standard penetrometer tests conducted in the field. The Unified Soil Classification System was used as the basis to describe all soil samples. Visual classification included density or consistency, color, moisture content, major soil type, and the modifying fractions of the samples. Grain-size analyses and moisture-content determinations were performed on the disturbed samples. Grain size analyses were performed in accordance with procedures detailed in AASHTO T88, and water content tests were performed in accordance with the procedures detailed in ASTM D-2216. The results of all laboratory tests for both project sites are presented in Appendix B.

PEDESTRIAN TRANSFER BRIDGE FOUNDATION SUPPORT

Several options are considered feasible for the construction of the proposed 54 inch diameter shaft foundations for the pedestrian transfer bridges. Recommended options are: drilled shafts, prebored cast-in-place concrete piles, or driven open-end pipe piles excavated and filled with reinforced concrete. For all three options, a minimum penetration depth into the very dense foundation soil of 10 ft, as specified in Section 6-05.3(1)B of the Standard Specifications, or the minimum depth required to develop adequate lateral load capacity, whichever is most critical, should be used.

Drilled Shafts

Fifty-four inch diameter drilled shafts are feasible at both sites. Design allowable shaft capacities versus depth of embedment into the very dense foundation material are shown in Figure 3. A total settlement of 1 inch or less can be expected to occur for the drilled shaft option. Post-construction settlement will be negligible.

Casing will need to be driven through the loose overlying soil and seated into the denser material in order to prevent the loose soil from flowing into the hole during the drilling operation. Difficult drilling can be expected due to the presence of cobbles and boulders in the very dense foundation soil. Total de-watering of the shaft excavation for concrete placement may not be possible due to seepage. If this is the case, concrete will need to be placed by a tremie method.

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Concrete Piling with Preboring

A second option is to use 54 inch diameter cast-in-place concrete piles in combination with preboring. Design allowable loads of 300 tons are feasible for this option without special load testing. Preboring will be needed to attain the required minimum penetration depths. As with drilled shaft construction, preboring may be difficult due to the presence of cobbles and/or boulders. The depth of pile penetration is expected to be roughly 3 ft above the depth of the prebore hole. This accounts for sloughing of the loose overlying soil into the prebored cavity.

Open-end Pipe Piles

The third option is to drive 54 inch open-end pipe piles to the required minimum penetration depth, and excavate the encased material to 2 ft above the pile tip so that concrete can be placed. An allowable load of 300 tons is recommended for this option. Difficult driving due to cobbles and/or boulders can be expected. Also, pile driving shoes will be required for this option.

ELEVATOR TOWER FOUNDATION SUPPORT

Precast, 24-inch, octagonal concrete piles have been proposed for elevator tower foundation support. We concur with this proposal. The precast concrete piles may be designed for an allowable load of 120 tons. Preboring will be required at both project sites to meet minimum embedment depth criteria. As discussed previously, preboring will be difficult because of cobbles and boulders present in the very dense foundation strata. Also, the expected depth of pile penetration will be approximately 3 ft above the bottom of the prebored cavity.

If uplift capacity is critical, we recommend that the proposed precast concrete piles be constructed with an "H" pile extension. Specific recommendations concerning this option are not included with this report. If this option is needed as an alternative, we should be contacted for final recommendations. As an estimate, 10 ft of penetration into the very dense foundation material by the "H" pile tip will result in an allowable uplift capacity of 10 tons.

PILE/SHAFT DESIGN - GENERAL

For use in analyzing the lateral load capacity of the pile/shaft foundations at both sites, a uniform or constant soil modulus should be assumed. A coefficient of horizontal subgrade reaction (K_s) of 1500 pci, i.e. $E_s = K_s$, can be used for the portion of the pile/shaft embedded below the potential scour depth or below the loose overlying soil, whichever is deeper.

For estimating quantities, final tip elevations should be based on the minimum embedment criteria from either Section 6-05.3(1)B of the Standard Specifications or from lateral load capacity determination, whichever is more critical.

We recommend that one test pile be driven for the elevator tower foundations at each project site.

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Attached for your use are copies of the Logs of Test Borings and laboratory test data in Appendices A and B respectively, for both project sites. Locations of the test borings are shown in Figures 1 and 2. Please note that Section 1-02.4 of the Standard Specifications allows potential bidders to inspect all factual data, which includes the boring logs and laboratory test data. This report should be disclosed in its entirety.

Very truly yours,



A. J. PETERS, P.E.
Materials Engineer

AJP:jmp
TLH
Attachments

cc: A. H. Walley

F3.48

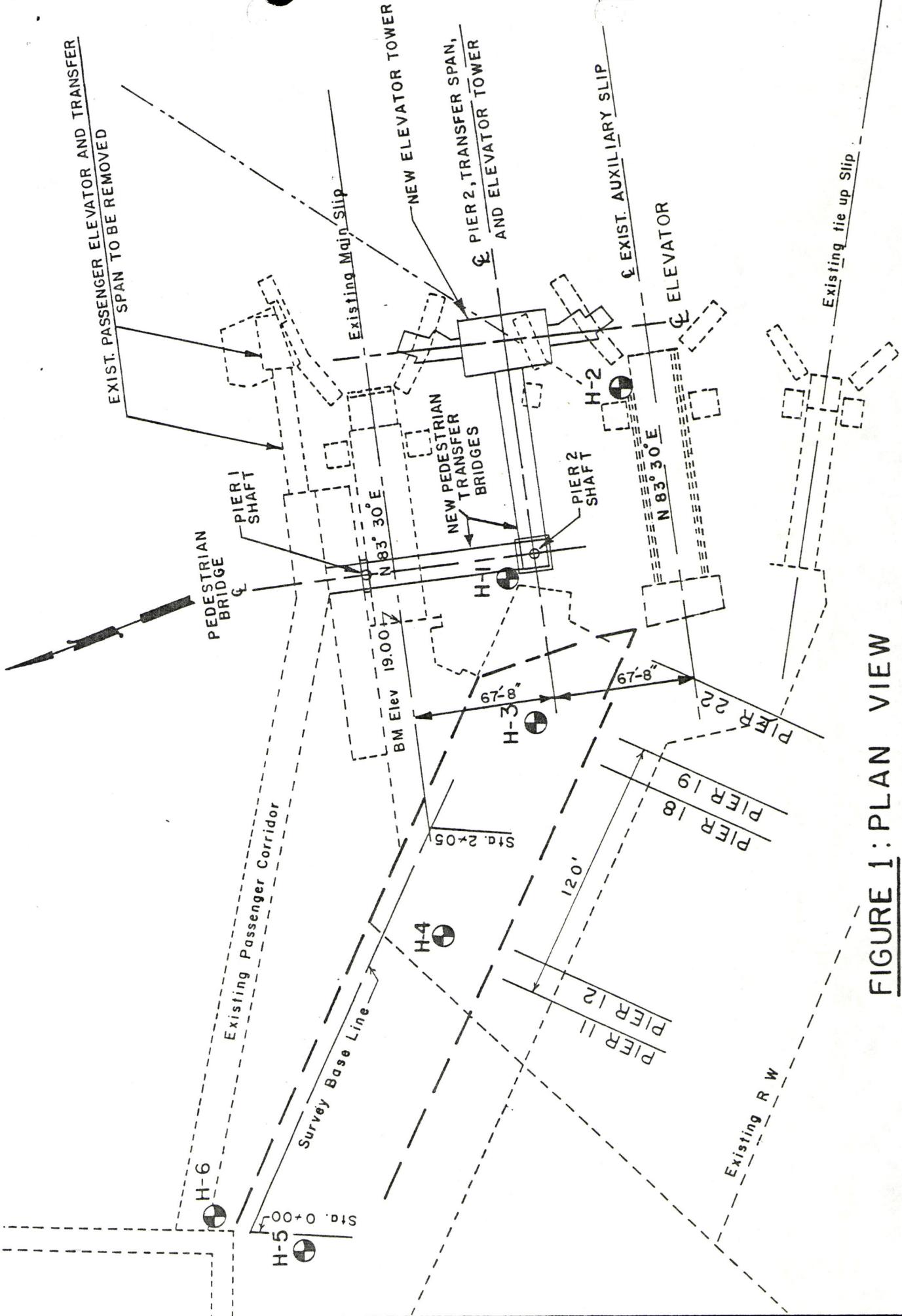


FIGURE 1: PLAN VIEW

WINSLOW FERRY TERMINAL

NOT TO SCALE

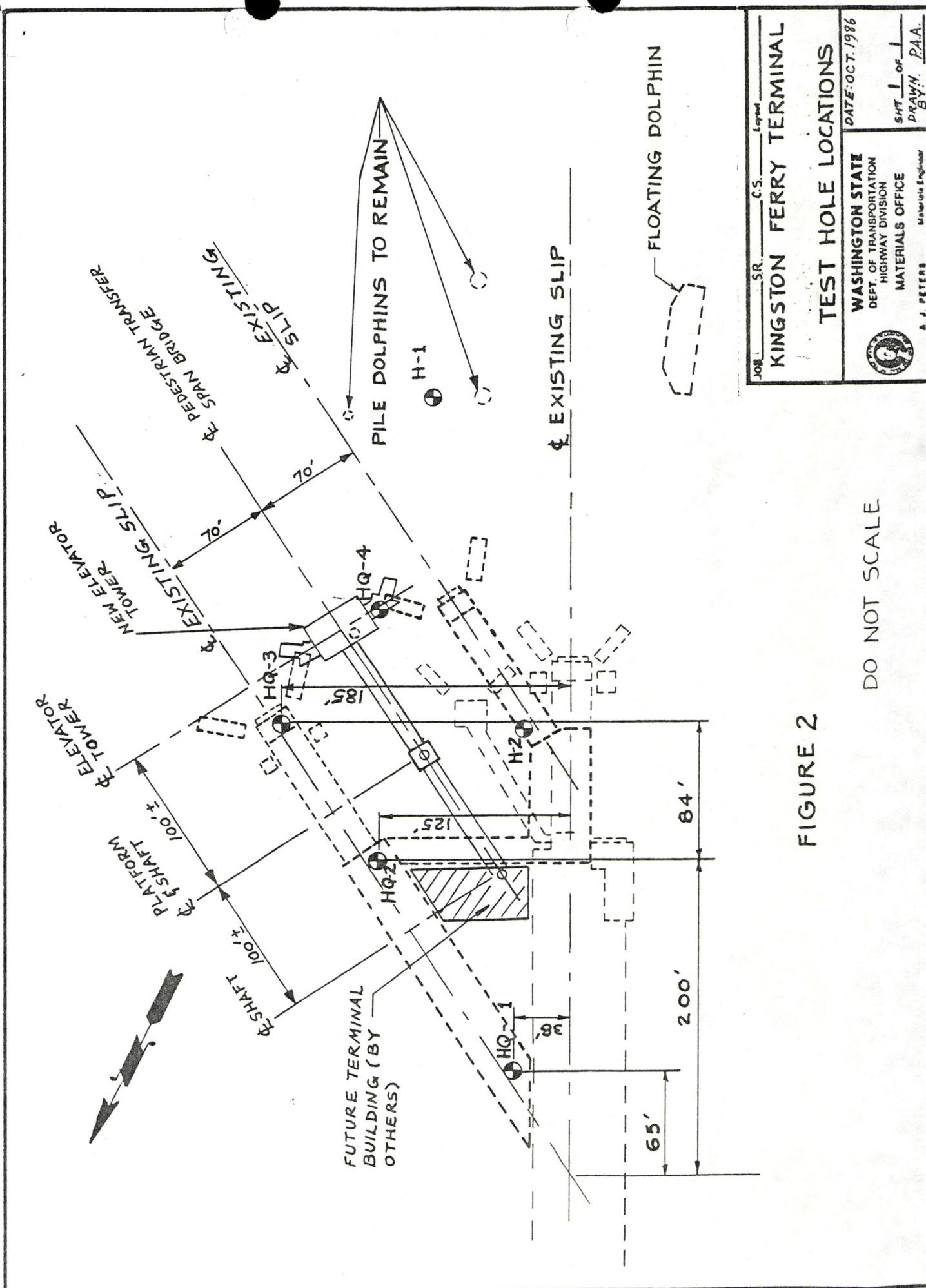
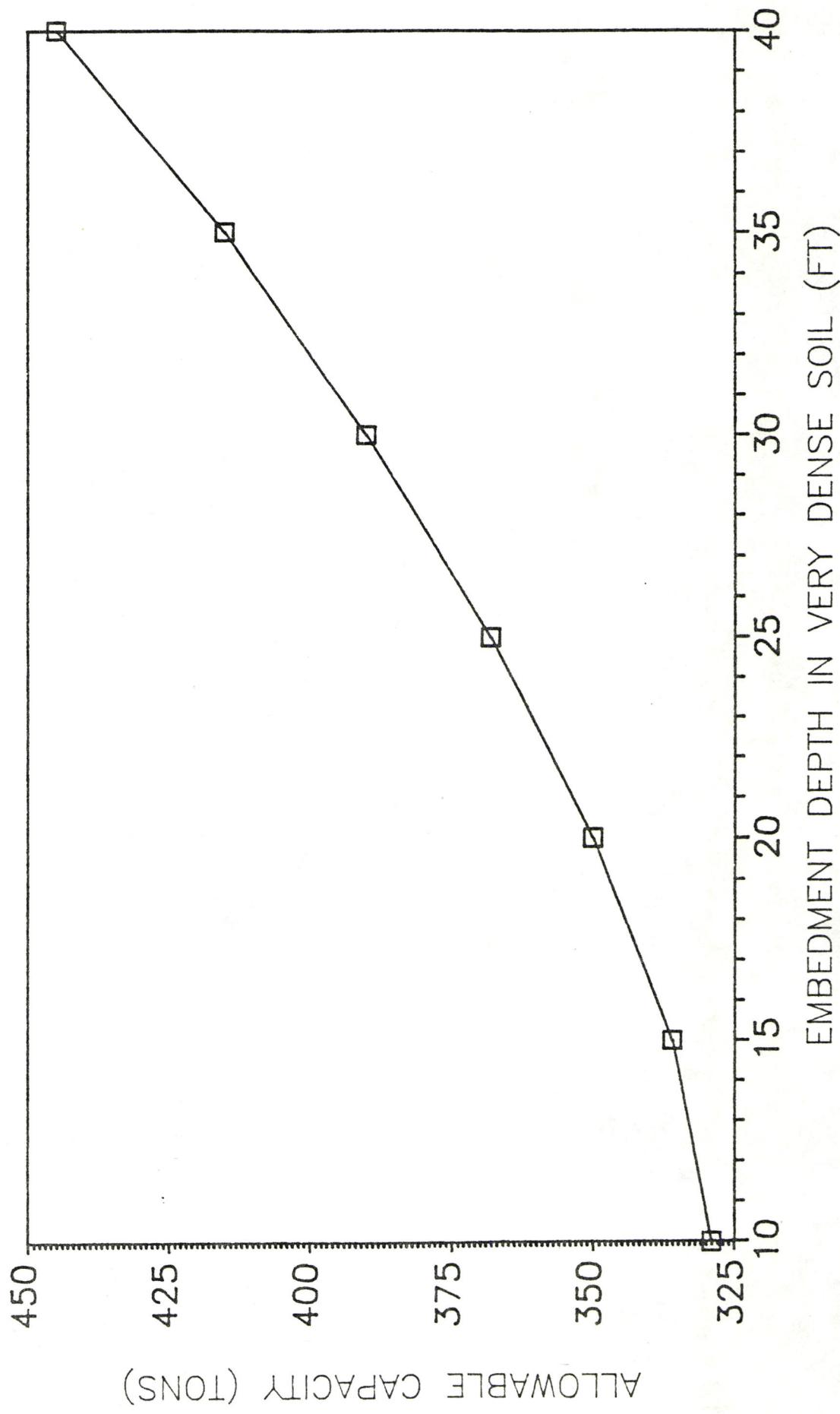


FIGURE 3:
TOTAL ALLOWABLE SHAFT CAPACITY
VS. DEPTH



NOTE: (1) SHAFT SETTLEMENT WILL BE 1" OR LESS.
(2) MINIMUM SHAFT DIAM.= 54 INCHES

APPENDIX A
LOGS OF TEST BORINGS

PART 1:

WINSLOW FERRY TERMINAL
PROJECT SITE

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

LOG OF TEST BORING

S.H. S.R. Section Winslow Ferry Slip Job No. R0862
Hole No. H-1 Sub Section Cont. Sec.
Station Offset Ground El. -7.7'
Type of Boring Wash Bore Casing 3" x 43.0' W.T. El. Puget Sound
Inspector Donald L. Nebgen Date May 20, 1976 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			2 ↑ Std 6 Pen	GRAVELLY SAND - clean fine to coarse
10		▼	5 ↓ 1 5	with sea shells - gray - loose
				SAND - silty fine to coarse gravelly
5				sand - with scattered lenses - very hard
62			21 ↑ Std 27 Pen	clayey silt - gray - very dense
			35 ↓ 2	
10				
94			31 ↑ Std 47 Pen 47 ↓ 3	
15				
20	123	↓	51 ↑ Std Pen	

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

Hole No. H-1 Sub Section Winslow Ferry Slip Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			77 ↓ 4	TILL - fine to coarse sand & gravel in very hard sandy clayey silt - gray very dense
25	115/10"		Std 55 ↑ Pen 60/4" ↓ 5	Very small % water loss - 20'-32'
30	130/9"		Std 80 ↑ Pen 50/3" ↓ 6	
35	97			SAND - silty fine to coarse sand with scattered lenses clayey silt & sand & gravel
40	108/10"		Std 38 ↑ Pen 45 ↓ 52 7	gray - very dense
45	130			SAND & GRAVEL - silty fine to coarse - gray - very dense
			Std 28 ↑ Pen 48 ↓ 60/4" 8	High % water loss 37' - 42'
				GRAVELLY SAND - very silty fine to coarse - gray - very dense
			Std 55 ↑ Pen 75 ↓ 9	

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

LOG OF TEST BORING

Winslow Ferry Slip

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

S.H. S.R. Section

Job No. R0862

Hole No. H-2 Sub Section

Cont. Sec. _____

Station _____ Offset _____

Ground El. -18'

Type of Boring Wash Bore Casing 3" x 43.0'
Inspector Donald L. Nebgen Date May 21, 1976

W.T. El. Puget Sound

Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
3			1 Std 1 Pen 2 1 2	SAND & GRAVEL - clean - fine to coarse with sea shells, bits of wood - black - very loose
5	33			SAND & GRAVEL - silty fine to coarse
10			10 Std 12 Pen 21 2	gray - compact to dense - cobble or small boulder 7' to 8'
115/6"			47	TILL - fine to coarse sand & gravel in sandy clayey silt - gray - very dense
15			115 Std Pen 3	
137			75 Std 62 Pen 4	SAND - silty fine to coarse, with lenses clayey silt & sand & gravel - gray very dense
20				

Hole No. H-2 Sub Section Winslow Ferry Slip Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
100/6"			Std	SAND - interbedded 6" to 12" layers
	100	↑ Pen	5	silty sand, gravelly sand & sandy till,
				Fine to coarse - gray - very dense
25				
110/9"			18 ↑ Std 60 ↓ Pen	
	50/3"	↓	6	
30				TILL - fine to coarse sand & gravel in
				sandy clayey silt - gray - very hard
35	100/2"		Std	
	100	↑ Pen	7	
				SAND - interbedded silty fine sand
				& gravelly sand, fine to coarse
				gray - very dense
40	144		56 ↑ Std 88 ↓ Pen	SANDY TILL - fine to coarse sand & gravel
			8	in sandy clayey silt with scattered lenses
				silty fine sand - gray - very hard
45	130/8"		Std	
	80 ↑ Pen		9	Test boring stopped at 43.7'
	50/2" ↓			

LOG OF TEST BORING

WASHINGTON ST. DEPARTMENT OF TRANSPORTATION

S.H. 305 S.R. 305 SECTION Winslow Ferry Terminal Job No. L-7745
 Hole No. H-3 Sub Section 1883
 Station 2+75 Offset 25' Rt Ground El. -4.2
 Type of Boring Chop Casing 3" I.D., +60' W.T. El. Variable above ground)
 Inspector _____ Date September 12, 1983 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
7		↑	3 STD 5 PEN 2 1	Loose, wet, gray, slightly silty, fine gravelly, fine to coarse SAND - with sea shells.
5	178	↓	68 STD 110 PEN 2	Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND. (Glacial till.)
10	121	↑	45 STD 59 PEN 62 3	Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND. (Glacial Till)
15	76	↓	36 STD 41 PEN 35 4	Very dense, gray, moist, fine to coarse sandy, very silty GRAVEL (Glacial till).
		↑		Fine sand layer.
		↓		layer of fine SAND - with glacial till lenses.
20		↑	36	

Hole No. H-3 Sub Section Winslow Ferry Dock Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
114			60 STD 54 PEN 5	Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND (Glacial till).
25	117/9"		80 STD 67 PEN 50 /3" 6	Layer of SAND - with glacial till lenses. Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND (Glacial till).
30	58/6"		45 STD 58 PEN 7	Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND (Glacial till).
35	99		53 STD 41 PEN 58 8	Very dense, gray, moist, fine gravelly, very silty fine to coarse SAND (Glacial till).
				Test boring stopped at 36.3' below ground elevation.
				This is a summary log of Test Boring. Soil/rock descriptions are derived from visual field identification and laboratory tests.

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 305 S.R. 305 SECTION Winslow Ferry Terminal Job No. L-7745
Hole No. H-4 Sub Section _____ Cont. Sec. 1883
Station 1+67 Offset 25' Rt. Ground El. +2.5
Type of Boring Chop Casing 3" I.D., -50.0' W.T. El. See bottom, sht
Inspector _____ Date September 14, 1983 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
4			2 ↑ STD 2 ↓ PEN	a) Very loose, gray, saturated, fine gravelly, silty, fine to coarse SAND - with shell fragments.
23 6"			2 ↓ 23 ↑ 1	b) Dense, gray, moist, fine gravelly, very silty, fine to coarse SAND (glacial till).
5				
83/6"				Sand Layer
10				
15				
135				
20				

Hole No. H-4

Sub Section..

Winslow Ferry Terminal

Sheet

of .

2

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 305 S.R. 305 SECTION Winslow Ferry Terminal Job No. L-7745
 Hole No. H-5 Sub Section _____ Cont. Sec. 1883
 Station 0+02 Offset 26' Rt. Ground El. 20.1
 Type of Boring _____ Casing 3" I.D., -45.0' W.T. El. See bottom sht #2
 Inspector _____ Date September 15, 1983 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
1			1 12" ↑ STD 12" ↓ PEN 12" ↓ 1	Very loose, gray, moist, fine gravelly, very silty, fine to coarse SAND and dark brown, soft, rotten WOOD - with fine sandy silt.
5				
100/5"			70 ↑ STD 100 ↓ PEN /5" 2	Very dense, gray, moist, fine gravelly, very silty, fine to coarse SAND (glacial till).
10				
102/6"			65 ↑ STD 102 ↓ PEN 3	Very dense, gray-brown, wet, fine to coarse sandy SILT - with a trace of fine gravel.
15				
100/4"			55 ↑ STD 100 ↓ PEN 7/4" 4	Very dense, gray, moist, gravelly, very silty, fine to coarse SAND. (Glacial till)
20				

Hole No. H-5 Sub Section Winslow Ferry Terminal Sheet 2 of 2

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 305 S.R. 305 SECTION Winslow Ferry Terminal Job No. L-7745
Hole No. H-6 Sub Section _____ Cont. Sec. 1883
Station 0+02 Offset 5' Lt. Ground El. 31.2
Type of Boring Portable penetrometer Casing _____ W.T. El. Not determined
Inspector _____ Date May 29, 1984 Sheet 1 of 1

PART II:

KINGSTON FERRY TERMINAL

PROJECT SITE

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. H-1 Sub Section Cont. Sec. 1881
 Station H-1 as shown on layout Offset Ground El.
 Type of Boring Wash Bore Casing 3" x 17.0' W.T. El. Puget Sound elev
 Inspector Date March 10, 1976 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				SAND- slightly silty, fine to coarse with bits of wood, bark, sea shells, gray, very loose.
5				
100/10"			24 ↑ STD 50 PEN 50/ ↓ 1 4"	Very dense, gray and brown, moist, SILT and fine sandy SILT with fine sand partings. Retained 1.3'.
10				
50/4"			54 ↑ STD 50/ ↓ PEN 4" 2	Very dense, gray and brown, wet, interbedded SILT and sandy SILT with a layer of fine to medium sand. Retained 1.0'.
15				
20				

Hole No. H-1 Sub Section Kingston Ferry Terminal Sheet 2 of 2

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. H-2 Sub Section Cont. Sec. 1881
 Station H-2 as shown on layout Offset Ground El.
 Type of Boring Wash Bore Casing 3" x 35.0' W.T. El. Puget Sound elev.
 Inspector Date March 12, 1976 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
5	4		4 STD 3 PEN	Very loose, gray, wet, silty, fine to coarse sandy GRAVEL with bits of wood and seashells. Retained 1.0'.
			1 1	Cobble 7.0' to 7.5'
			21 STD 18 PEN	A. Dense, brown, moist, sandy SILT and silty, fine sandy GRAVEL.
	41		23 2 36	B. Dense, brown, moist SILT and fine sandy SILT. Retained 1.8'.
10				
15	82		19 STD 36 PEN	Very dense, gray and brown, moist, SILT and sandy SILT.
			46 3	Retained 1.5'.
				3" layer sand and gravel 18.0'.
20	50/4"		54 STD 50/4" PEN 4 4	Very dense, gray and brown, moist, SILT and sandy SILT. Retained 0.8'.

Hole No. H-2 Sub Section Kingston Ferry Terminal Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
25	65/5"		60 ↑ STD 65/ ↓ PEN 5"	No recovery
			5	
30	110/10"		29 ↑ STD 60 ↓ PEN 50/ 4"	Very dense, greenish-gray, wet, slightly silty, fine SAND. Retained 1.3'.
			6	
35	100/8"		42 ↑ STD 50 ↓ PEN 50/ 3"	Very dense, greenish-gray, wet, slightly silty, fine SAND with lense of clayey silt. Retained 1.2'.
			7	
40				
40	80		29 ↑ STD 36 ↓ PEN 44 ↓ 50/	Very dense, gray, wet, silty, fine SAND.
			8	
			5"	Test boring stopped at 41.9' below ground elevation.
				Water depth 14.0' below ground elevation.
				This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 104 S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. HQ-1 Sub Section _____ Cont. Sec. 1881
 Station HQ-1 as shown on layout Offset 0' Ground El. -6.5'
 Type of Boring Wash and Chop Casing 3" x 17" W.T. El. Tide
 Inspector _____ Date May 3, 1985 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
16			2 STD 5 PEN 11 1 20	Medium dense, brown, wet, slightly silty, fine to coarse sandy GRAVEL with shells and wood. Large boulders on shoreline near Ferry Terminal.
5			30 STD 38 PEN 50/ 2 3"	Very dense, brown, wet, SAND and GRAVEL with cobbles. (Visual I.D. only)
10			22 STD 33 PEN 55 3	Very dense, brown, wet, very silty, fine SAND.
15			20 STD 42 PEN 80 4	Very dense, brown, wet, very silty, fine SAND.
20				

Hole No. HQ-1 Sub Section Kingston Ferry Terminal

Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
25	110		17 ↑ STD 35 ↓ PEN	Very dense, brown, moist, fine sandy SILT with layers of silt
			75 ↓ 5	and silty sand.
30	95		30 ↑ STD 45 ↓ PEN	Very dense, brown and gray, moist, very silty, fine SAND with silt
			50 ↓ 6	layers and silty sand.
35	50		16 ↑ STD 23 ↓ PEN	Dense, gray, moist, fine sandy SILT with layers of silt.
			27 ↓ 7 45 ↓	
40				Stopped test boring at 37' below ground elevation.
				This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 104 S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. HQ-2 Sub Section _____ Cont. Sec. 1881
 Station HQ-2 as shown on layout Offset 0' Ground El. -6.5'
 Type of Boring Wash and Chop Casing 3" x 20' W.T. El. Tide
 Inspector _____ Date May 3, 1985 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	17		6 STD 7 PEN 10 1 12	No recovery. (Medium dense, brown, wet, sand, shells and wood.)
5	54			Coarse sand, shells and gravel.
10	95		20 STD 22 PEN 32 2 55	Very dense, brown, wet, SILT.
15				
20	82		25 STD 70 PEN 3 3 51 4	Very dense, brown, wet, fine sandy SILT with layers of silt and silty sand.

Hole No. HQ-2 Sub Section Kingston Ferry Terminal Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
80			24 ↑ STD 35 PEN 45 ↓ 5	Very dense, brown, moist, silty, fine SAND.
25				
108			19 ↑ STD 39 PEN 69 ↓ 6	Very dense, brown, moist, silty, fine SAND.
30				
134			18 ↑ STD 34 PEN 100 ↓ 7	Very dense, brown and gray, moist, very silty, fine SAND with layers of silt and coarse sand..
35				
155			18 ↑ STD 55 PEN 100 ↓ 8	Very dense, gray, moist, gravelly, silty, fine to coarse SAND.
40				Stopped test boring 36.5' below ground elevation.
				This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 104 S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. HQ-3 Sub Section _____ Cont. Sec. 1881
 Station HQ-3 as shown on layout Offset _____ Ground El. -12.5'
 Type of Boring Wash and Chop Casing 3" x 14' W.T. El. Tide
 Inspector _____ Date May 3, 1985 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	8'		2 STD 3 PEN 5 1 7	Loose, brown and white, wet, slightly silty, fine to coarse SAND with shells and wood.
5				
	80		31 STD 35 PEN 45 2	No recovery. (Very dense, brown, wet, slightly silty, coarse SAND with gravel.)
10	41		13 STD 18 PEN 23 3 50	Dense, brown and gray, moist SILT with layers of fine sand
15	40		15 STD 18 PEN 22 4 34	Dense, gray with brown, moist, fine sandy SILT
20	81		20 STD 31 PEN	Very dense, gray with brown, moist, fine sandy SILT

Hole No. HQ-3 Sub Section Kingston Ferry Terminal Sheet 2 of 2

LOG OF TEST BORING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

S.H. 104 S.R. 104 SECTION Kingston Ferry Terminal Job No. RO-2029
 Hole No. HQ-4 Sub Section _____ Cont. Sec. 1881
 Station HQ-4 as shown on layout Offset 50' North Ground El. 14.5'
 Type of Boring Wash and Chop Casing 3" x 20' W.T. El. Tide
 Inspector _____ Date May 3, 1985 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				Coarse sand, shells and gravel
14			17 STD 7 PEN	Medium dense, brown and gray, moist, silty, gravelly, fine to
5			7 1 13	coarse sand with shells.
10	105		14 STD 35 PEN	Very dense, brown, wet, fine sandy SILT layered with silt and
			70 2	coarse sand.
15				
107			25 STD 42 PEN	Very dense, gray, wet, slightly silty, fine to medium SAND.
			65 3	
20				

Hole No. HQ-4

Sub Section Kingston Ferry Terminal

Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
76			16 ↑ STD 25 PEN 51 ↓ 4	Very dense, gray and brown, wet, silty, fine SAND.
25	49		12 ↑ STD 21 PEN 28 ↓ 5 40	Dense, gray, moist SILT.
30	54		15 ↑ STD 24 PEN 30 ↓ 6	Very dense, gray and brown, moist, slightly silty, fine to medium SAND.
35	110		15 ↑ STD 35 PEN 75 ↓ 7	Very dense, gray and black, moist, slightly silty, fine to medium SAND.
40			15 ↑ STD 45 PEN 65 ↓ 8	No recovery.
45				Stopped test boring 43.5' below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

APPENDIX B
LABORATORY TEST DATA

PART 1:

WINSLOW FERRY TERMINAL

PROJECT SITE

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

DIRECTOR OF HIGHWAYS
Materials Laboratory
P. O. Box 167
Olympia, Washington 98504

Place Winslow

Date 5-21-76

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples:

Contract or R0862 Section Winslow Ferry SL 10
Job No. SR No. Sub-Section

Hole #	Station & Offset	Drive #	Depth	Tube Position in Sampler	Description	Remarks
D-6868-1		1	0.0' 2.0'			<u>Disturbed</u>
"-2	"	2	5.0' 6.5'			"
"-3	"	3	11.0' 12.5'			"
"-4	"	4	19.5' 20.5'			"
"-5	"	5	24.5' 25.3'			"
"-6	"	6	28.5' 29.2'			"
"-7	"	7	33.0' 34.5'			"
"-8	"	8	38.0' 39.3'			"
"-9	"	9	43.0' 44.0'			"

1 copy with samples
1 copy to addressee

HWY FORM 051-002 (H.F. 26.63) -
REVISED 2/73

Yours very truly,
Donald L. Nettgen

Inspector.

Disturbed Samples

Job No. R0-862. Section Winslow Ferry Slip

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

DIRECTOR OF HIGHWAYS
Materials Laboratory
P. O. Box 167
Olympia, Washington 98504

Place Winslow
Date 5-21-76

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples:

Contract or Section Winslow Ferry SL.P
Job No. R0862 SR No. Sub-Section

Hole #	Station & Offset	Drive #	Depth	Tube Position in Sampler	Description	Remarks
2-6869-1		1	0.0' 2.0'			<i>Disturbed</i>
" -2	"	2	4.5' 6.5'			"
" -3	"	3	11.0' 11.5'			"
" -4	"	4	16.0' 17.0'			"
" -5	"	5	21.0' 21.5'			"
" -6	"	6	25.0' 26.2'			"
" -7	"	7	34.5' 34.6'			"
" -8	"	8	39.0' 40.0'			"
" -9	"	9	43.0' 43.7'			"

1 copy with samples
1 copy to addressee

HWY FORM 351-002 H.F. 26.63
REVISED 2/73

Yours very truly,

Donald J. Nebyon

Inspector.

H-2

Disturbed Samples

Job No. R0-862 Section Winslow Ferry Slip

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)
1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Winslow, Wash.

Date Sept. 8, 1983

Dear Sir:

I have forwarded by today's the following Foundation Samples.

Contract or
Job No.

Section Winslow Ferry Terminal
SR No. 305 Sub-Section

Station &
Offset 2+75, 25' RT.

Hole # H-3

Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
4953 -1	D-1	0.0 to 2.0'	16.8	SW	Wet, Black, sly. silty, F. gravelly, F-C Sand with sea shells
-2	D-2	4.8' 5.8' to	10.2	SM	Moist, Grey, F. gravelly, V. silty, F-C Sand
-3	D-3	9.8' 11.8'			Same
-4	D-4	14.8' 16.5		GP	Moist, grey, F-C Sandy, V. silty, 1" (-) S.R. gravel (insufficient sample quantity)

1 copy with samples
1 copy to addressee

Yours very truly,

J. M. C. L. F. Inspector

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory
P. O. Box 167, Olympia, WA 98504 (Mailing Address)
1655 So. 2nd Ave.
Tumwater, Washington 98504 (Shipping Address)

Place Winslow, Wash.

Date Sept. 13, 1983

Dear Sir:

I have forwarded by today's the following Foundation Samples.

Contract or Section Winslow Ferry Terminal
Job No. SR No. 30.5 Sub-Section

Station & Offset 2+75, 25' RT.

Hole # H-3 (Between Piers 18 & 19)

Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
4955 -1	D-5	19.8' to 21.3'		SM	Moist, Grey, F. gravelly, V. silty, F-C Sand
-2	D-6	24.8' to 26.0'	8.0	SM	Moist Grey, F. gravelly, V. silty, F-C Sand
-3	D-7	29.8' to 30.8'			Same
-4	D-8	34.8' to 36.3'			Same

1 copy with samples
1 copy to addressee

Yours very truly,

James D. Lance
Inspector

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAMPLE NO. 4953-7 JOB NO. H-3
DATE 12/16/83 OPERATOR AS

SOIL FIELD IDENTIFICATION

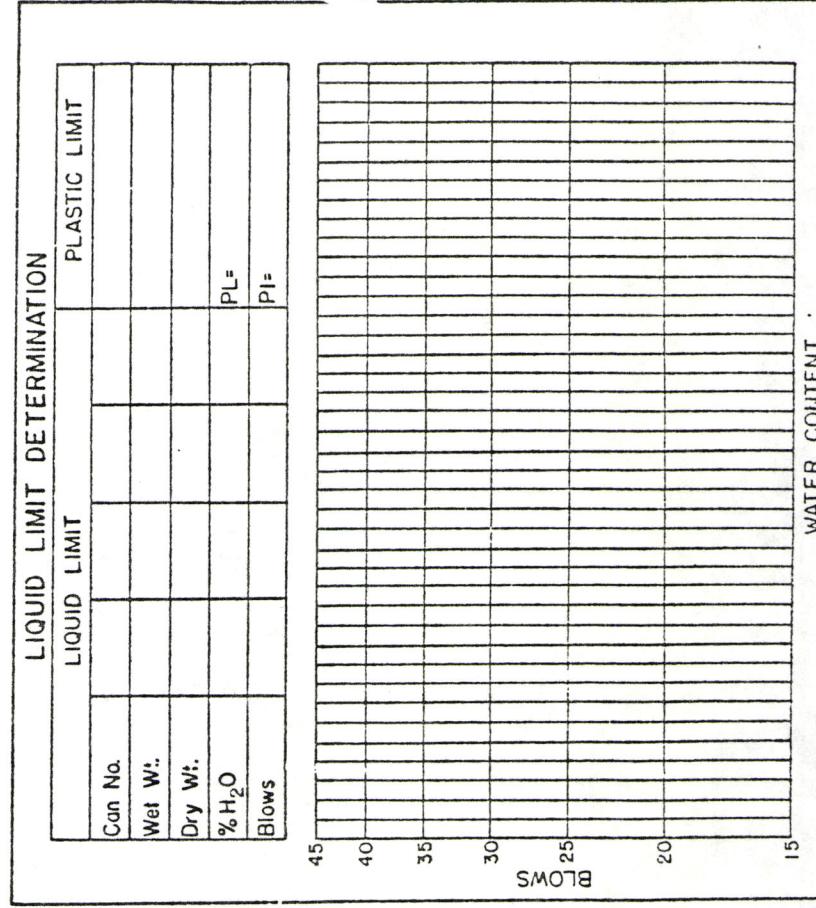
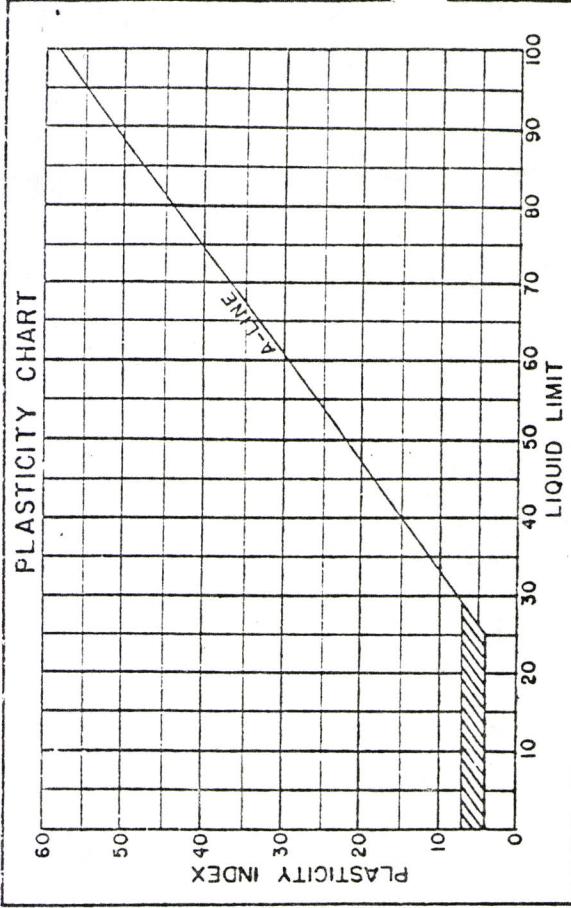
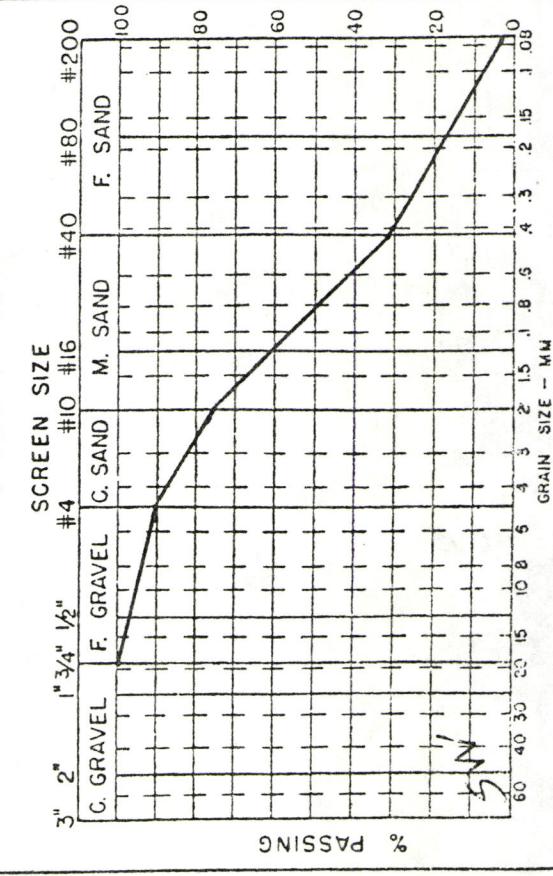
TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	

DESCRIPTION: Wet, back, silty, sticky,
F. gravelly, E-C sand

31.60 36.92 175.98
SIEVE ANALYSIS % Passing

-3/4 16.08	100%	-40 47.79	31.60
-4 25.55	90.7	-80 -140	
-10 25.86	76.3	-200 6.70	3.6

GRAIN SIZE CURVE



WATER CONTENT

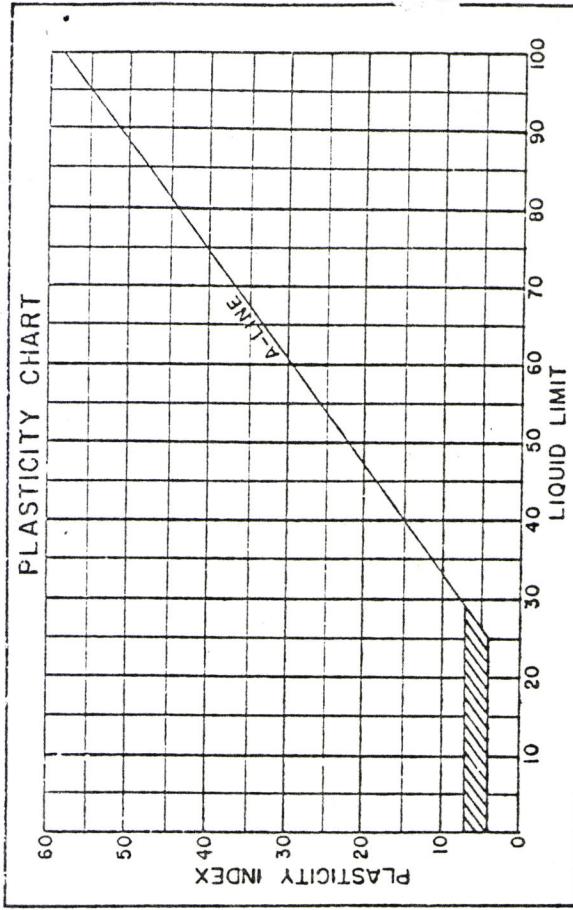
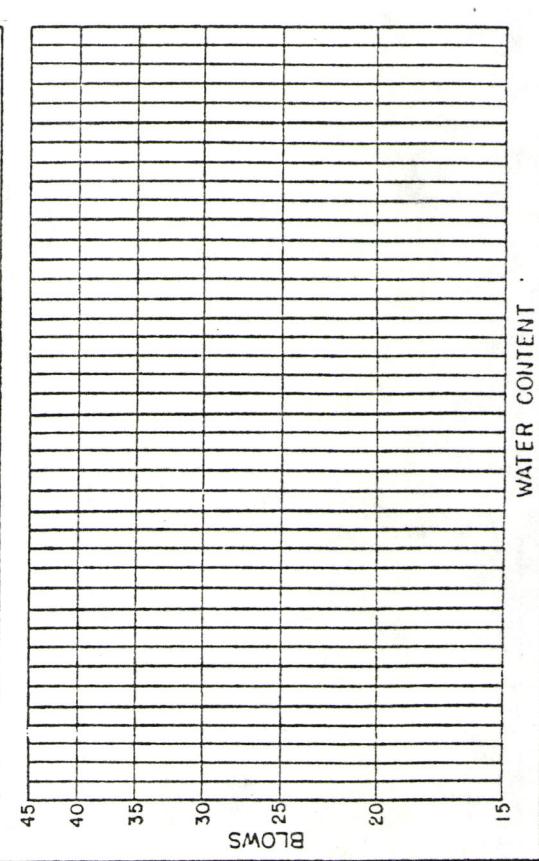
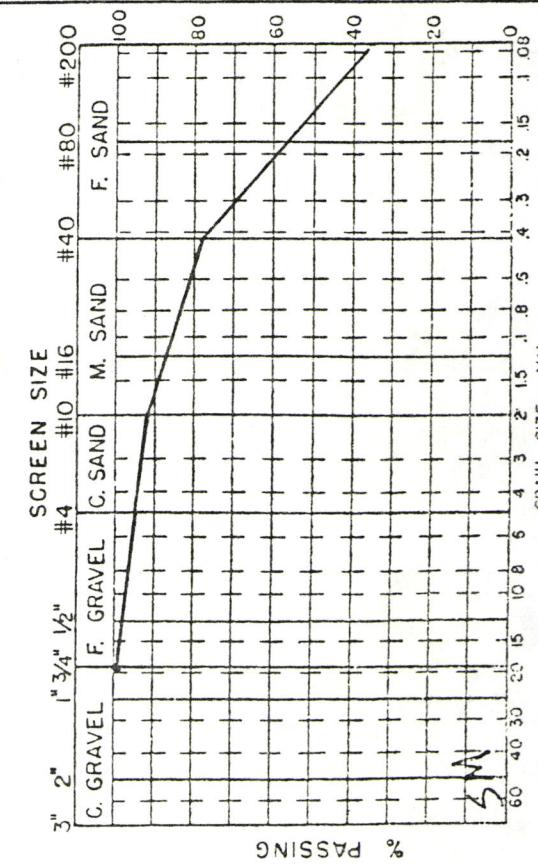
SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAMPLE NO. 4953-2	JOB NO.	HOLE NO. H-3
DATE 10/10/83	OPERATOR AS	
SOIL FIELD IDENTIFICATION		
TEST	SAND	SILT
VISUAL	✓	✓
DRIED CAST	✓	✓
DILATANCY		
BITE		
TOUGHNESS	✓	✓
DESCRIPTION: <i>Moist, Grey, F. gravelly, Very Silty, E-C Sand</i>		

34.55 38.06
% H₂O = 10.20
85.08

SIEVE ANALYSIS % Passing	
-40	77.92
-80	78.0
-140	
-200	66.43
	35.9

GRAIN SIZE CURVE



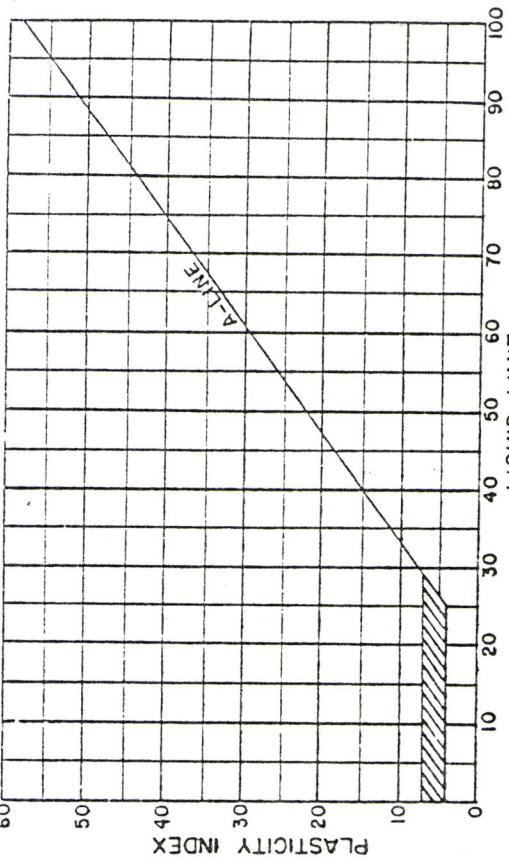
SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAMPLE NO. 49534 JOB NO. H-3
DATE 10/10/83 OPERATOR AS

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	
DESCRIPTION: <i>Moist / grey F-C Sandy Very Silty 1" (-) S. K. gravel.</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

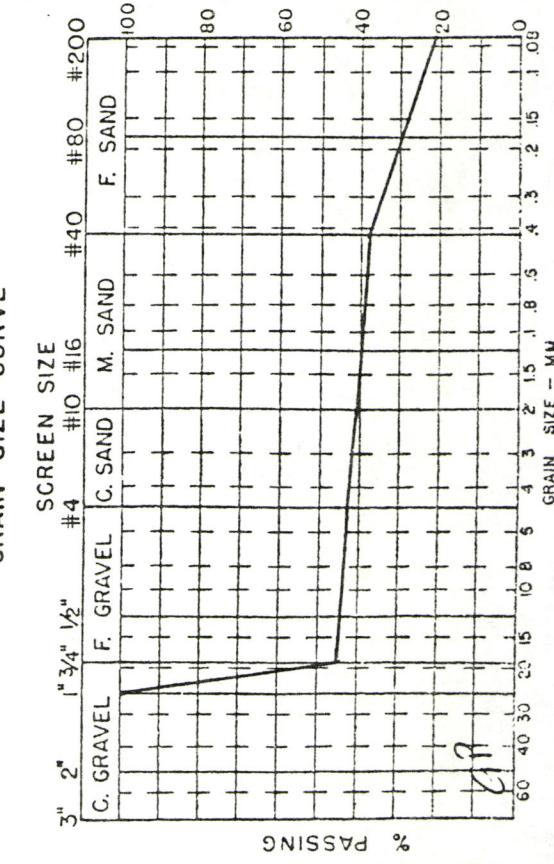
	LIQUID LIMIT	LIQUID LIMIT	PLASTIC LIMIT
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			
Blows			
PL =			
PI =			

29. 40

SIEVE ANALYSIS % Passing

-1"	16.5%	100%	-40	5.0	38.2%
-3/4 0.34	43.9	80			
-4 0.32	42.7	40			
-10 0.92	41.6%	200	6.24	21.2%	

GRAIN SIZE CURVE



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAME IF NO. 4955-2 JOB NO. H-3

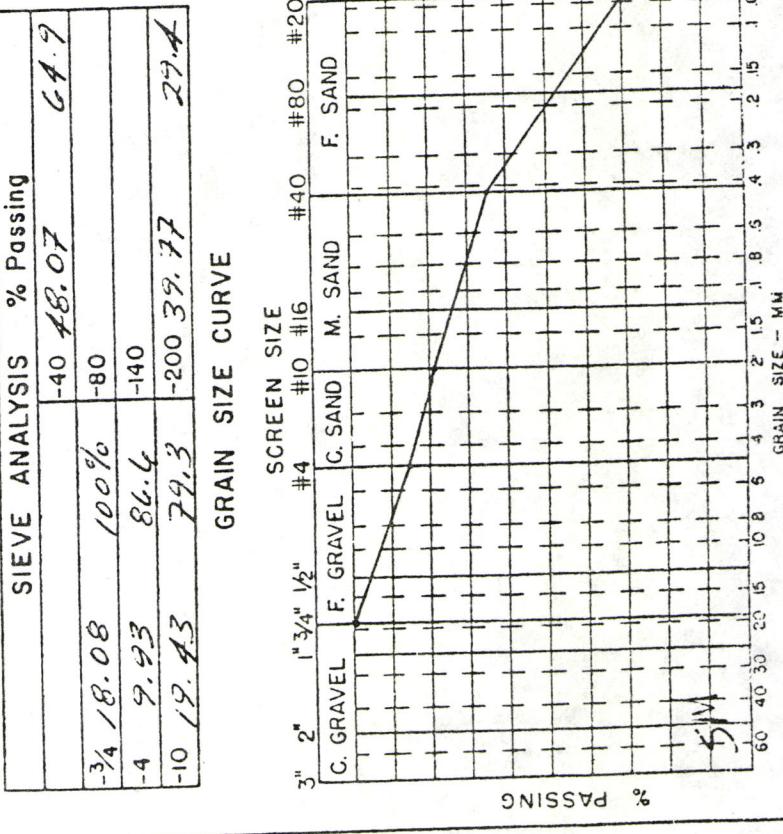
DATE 12/10/02 OPERATOR AS

SOIL FIELD IDENTIFICATION

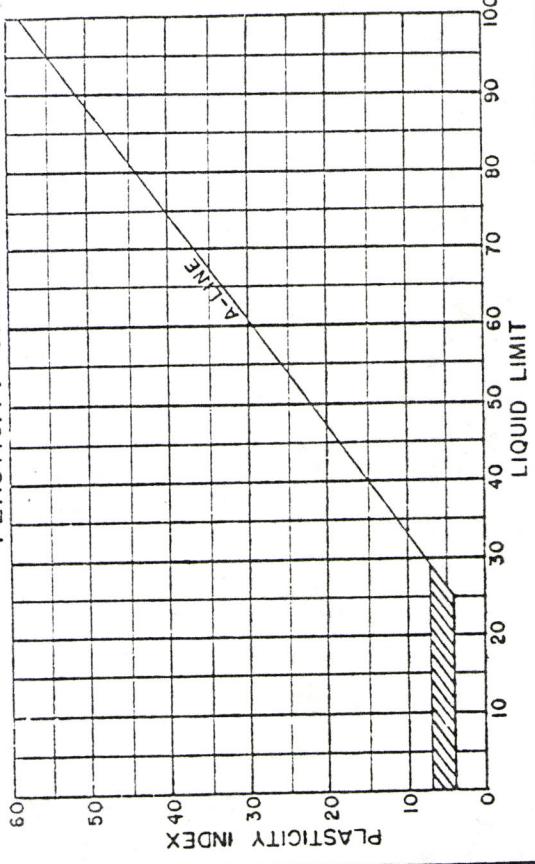
TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	

DESCRIPTION: *Moist, Grey, F. gravelly,
Very S. I. y., E-C Sand*

22.86 24.70 % H₂O = 8.0
135.28



PLASTICITY CHART



LIQUID LIMIT DETERMINATION

	L I Q U I D L I M I T	P L A S T I C L I M I T
C a n N o .		
W e t W . :		
D r y W . :		
% H ₂ O		P _L =
Blows		P _I =

A blank graph grid consisting of a large number of horizontal and vertical lines forming a grid pattern. The vertical axis on the left is labeled 'BLOWS' at the bottom and has numerical markings at 45, 40, 35, 30, 25, and 20. The horizontal axis on the right is labeled 'WATER CONTENT' at the top and has numerical markings at 15.

WATER CONTENT

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)

1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Winslow, Wash.

Date Sept. 14, 1983

Dear Sir:

I have forwarded by today's the following Foundation Samples.

Contract or

Section Winslow Ferry Terminal

Job No.

SR No. 305 Sub-Section

Station & Offset 1+67, 25' RT.

Hole # H-4

Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
4956-1	D-1	0.0' to 1.7'	a	SP- SM	wet, black, F. gravelly, silty, F-C Sand
-2	"	1.7' to 2.0'	b	SM	moist, grey, F. gravelly, v. silty F-C Sand
-3	D-2	8.1' to 9.1'			same
-4	D-3	15.2' to 16.8'	11.2	SM	moist, grey, F. gravelly, v. silty, F-C Sand
-5	D-4	20.2' to 21.2'	10.3	SM	moist, grey, 1"(-) S.R., v. silty, F-C Sand
-6	D-5	25.2' to 26.2'		SM	moist, grey, F. gravelly, v. silty, F-C Sand

1 copy with samples

1 copy to addressee

Yours very truly,

James D. Farrel

Inspector

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

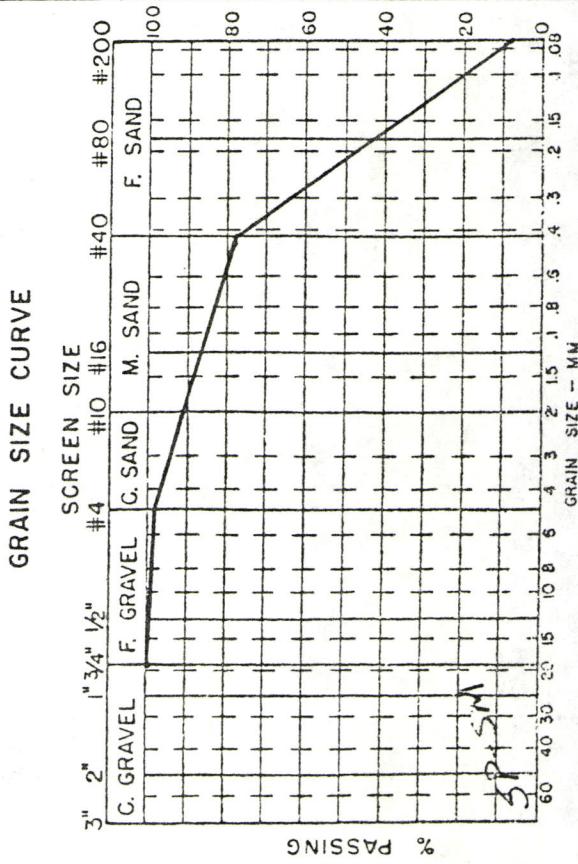
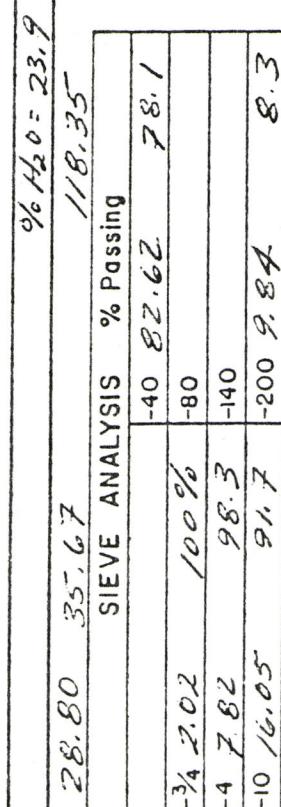
SAMPLE NO. 4956-1 JOB NO. HOLE NO. H-4

DATE 10/10/83 OPERATOR AS

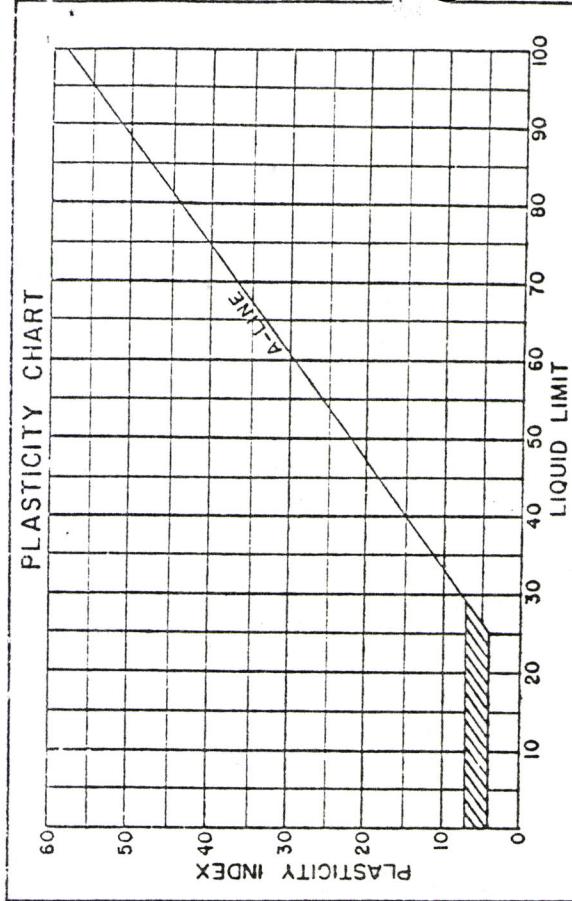
SOIL FIELD IDENTIFICATION

TEST	SILT	SAND	SILT	CLAY
VISUAL		✓	✓	
DRIED CAST		✓	✓	
DILATANCY				
BITE				
TOUGHNESS		✓	✓	

DESCRIPTION: Wet, Black, F. gravelly, silty, E-C Sand

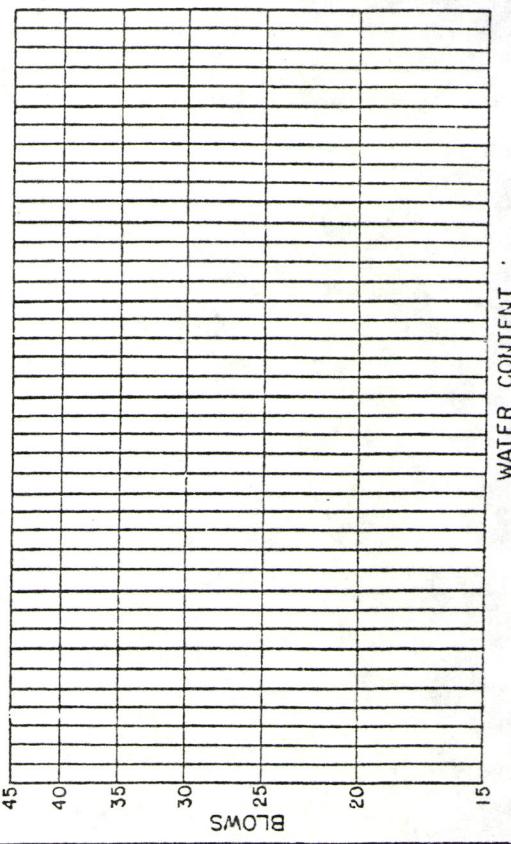


PLASTICITY CHART



LIQUID LIMIT DETERMINATION

	LIQUID LIMIT	PLASTIC LIMIT
Can No.		
Wet Wt.		
Dry Wt.		
% H ₂ O		PL =
Blows		PI =



PART II:

KINGSTON FERRY TERMINAL

PROJECT SITE

Disturbed Samples

H-1

Job No. R0-862 : Section Kingston Ferry Slip

H-2

Disturbed Samples

Job No. R0-862 Section Kingston Ferry 5110

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)
1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Olympia

Date 5/3/85

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples.

Contract or Job No. R0-2029 Section Kingston Ferry Terminal
SR No. Sub-Section

Station & Offset HQ-1 OH LAYOUT

Hole # H6-1

E	Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
	6032-1	D-1	0'-2'	H2O 10.6% ₁₀	GP	
-2	D-2		5'-6'3"			(VISUAL ID. ONLY) INSUFFICIENT MAT.
-3	D-3	11'-12.5'	21.0%	Sm		
-4	D-4	17'-18.5'			LK.	6032-3
-5	D-5	24'-25.5'	25.2% ₁₀	ML		
-6	D-6	30'-31.5'	20.9% ₁₀	Sm		
-7	D-7	35'-37'	25.0% ₁₀	ML		

1 copy with samples
1 copy to addressee

Yours very truly,

C.H. Scovill

Inspector

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

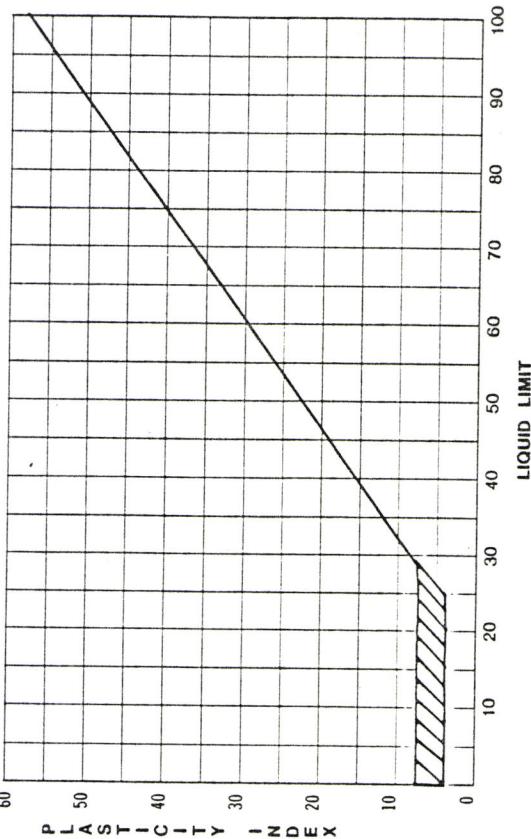
SAMPLE NO. C-32-1 JOB NO. R-227 HOLE NO. 1

DATE 5-25-55 OPERATOR Jim

SOIL FIELD IDENTIFICATION

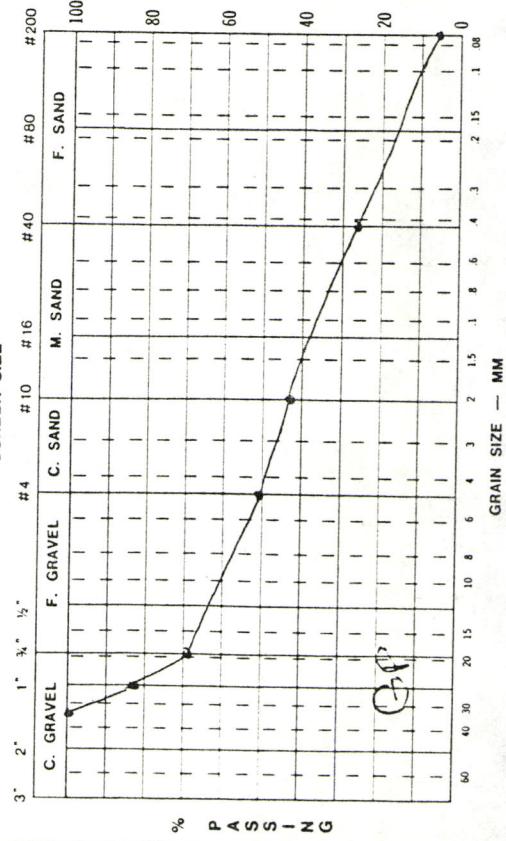
TEST	SAND	SILT	CLAY
VISUAL	L	L	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: Grey, Black, moist, sticky, sandy, silty, F-C, slightly, fine-grained			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

Can No.	LIQUID LIMIT			PLASTIC LIMIT		
	Wet Wt.	Dry Wt.	% H ₂ O	PL	PI	



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

SAMPLE NO. 652-2 JOB NO. R62021 HOLE NO. 1

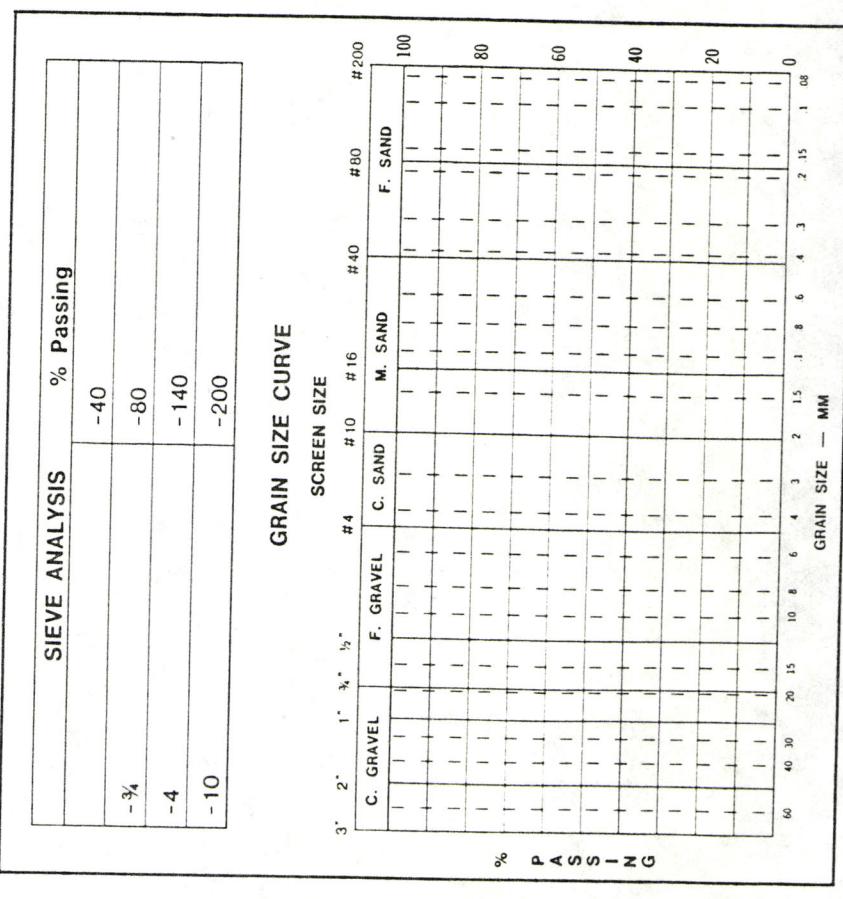
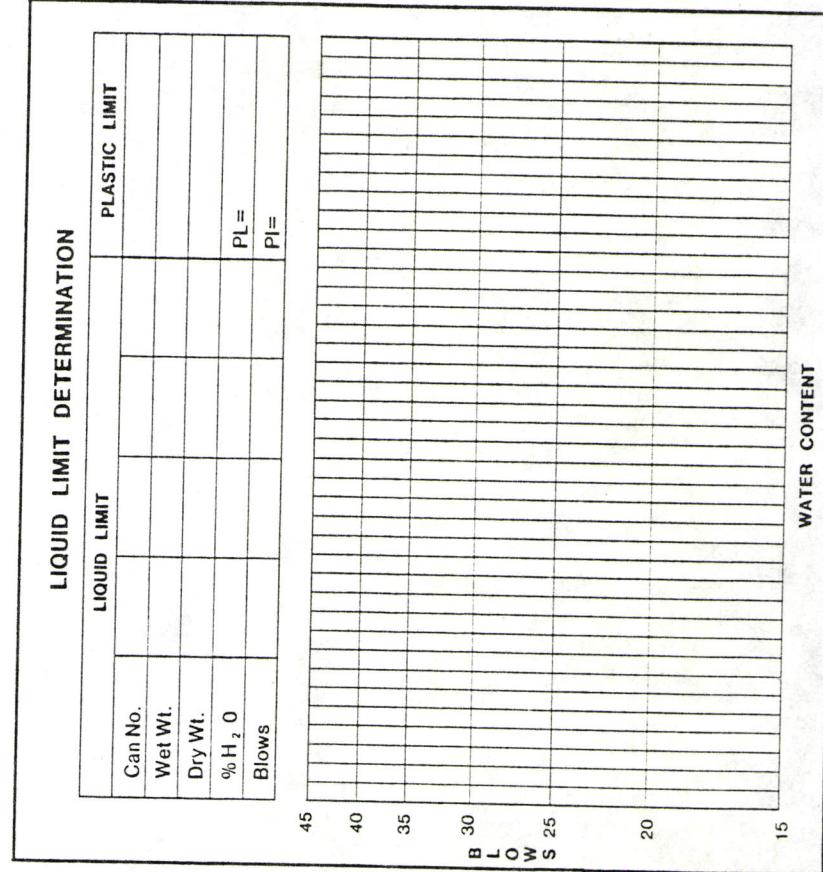
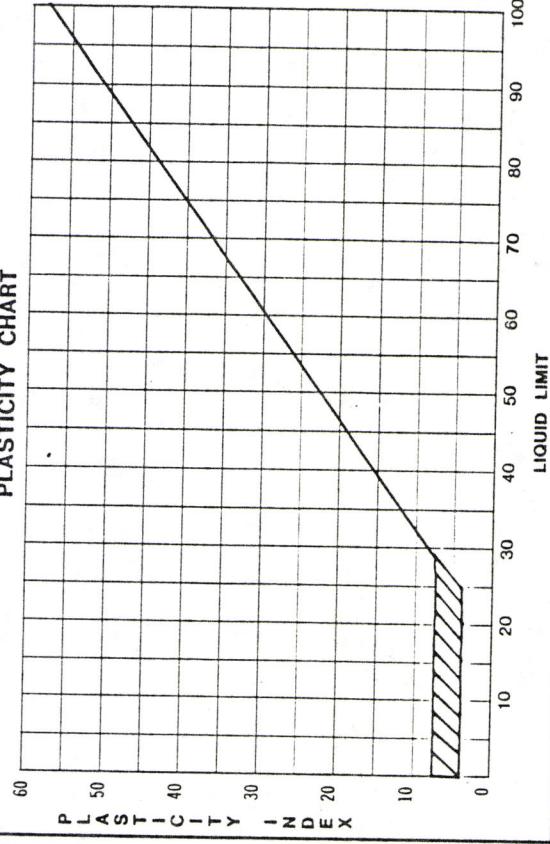
DATE 5-17-2015 OPERATOR John

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

DESCRIPTION: *GRANULAR*, *DRY*, *C. GRAVEL*

(Visual Test Only) *INCOHERENT MUD*



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

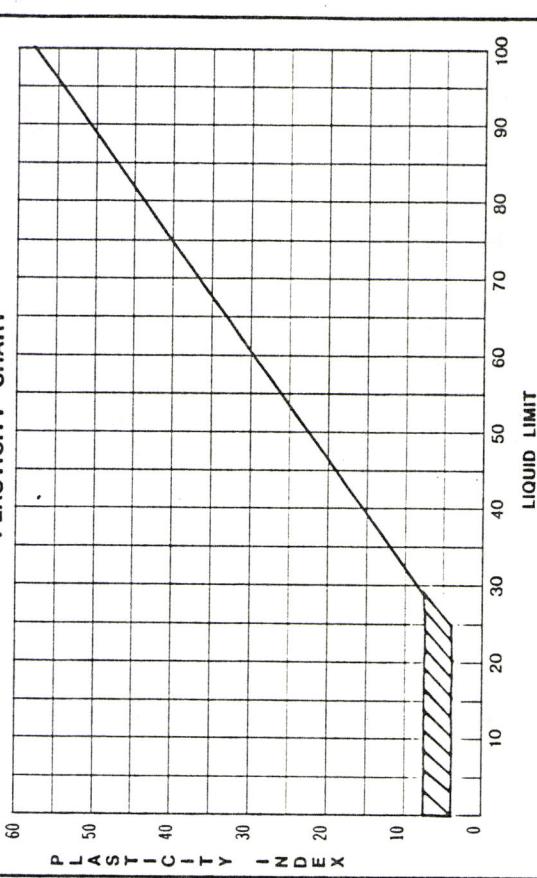
SAMPLE NO. 6032-3, JOB NO. 60221 HOLE NO. 1

DATE 5-9-55 OPERATOR Jm

SOIL FIELD IDENTIFICATION

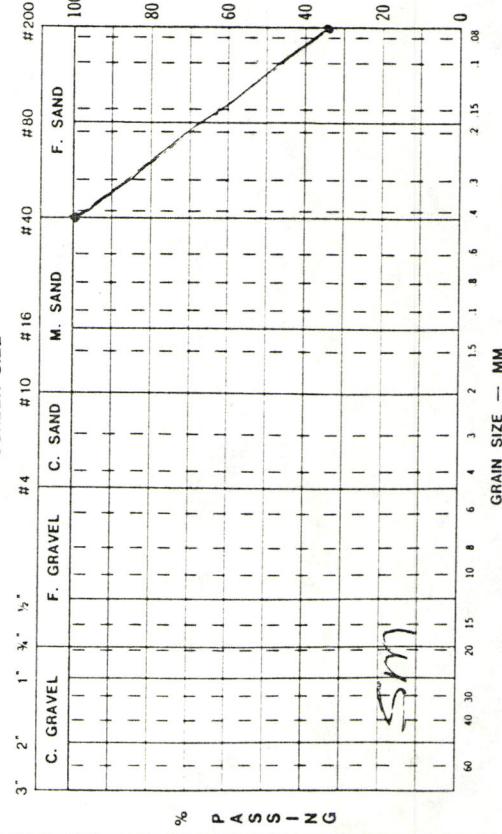
TEST	SAND	SILT	CLAY
VISUAL	L		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>ROCK, MOIST, V. SILTY, FINE SMOOTH</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

Can No.	LIQUID LIMIT			PLASTIC LIMIT		
	Wet Wt.	Dry Wt.	% H ₂ O	Blows	PL =	PL =
-3/4	-80					
-4	-140					
-10	-200					



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

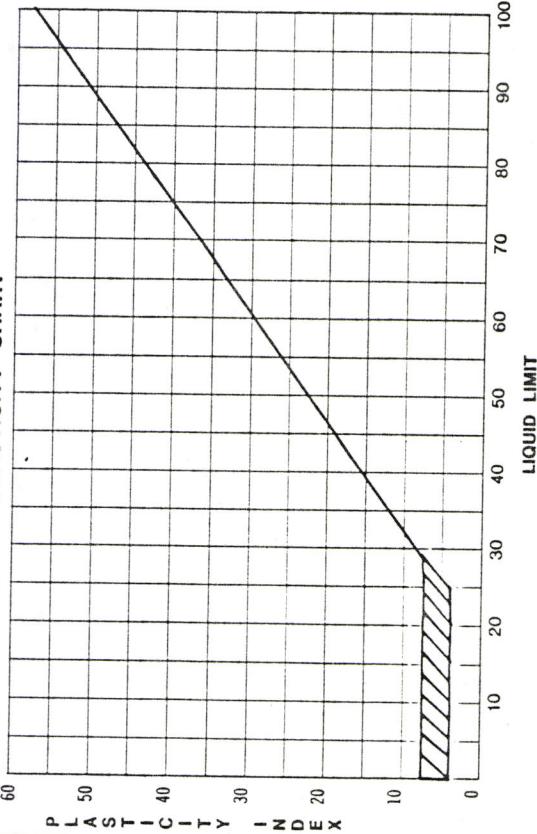
SAMPLE NO. 6032-S JOB NO. 61-2029 HOLE NO. 1

DATE 5-9-85 OPERATOR Jm

SOIL FIELD IDENTIFICATION

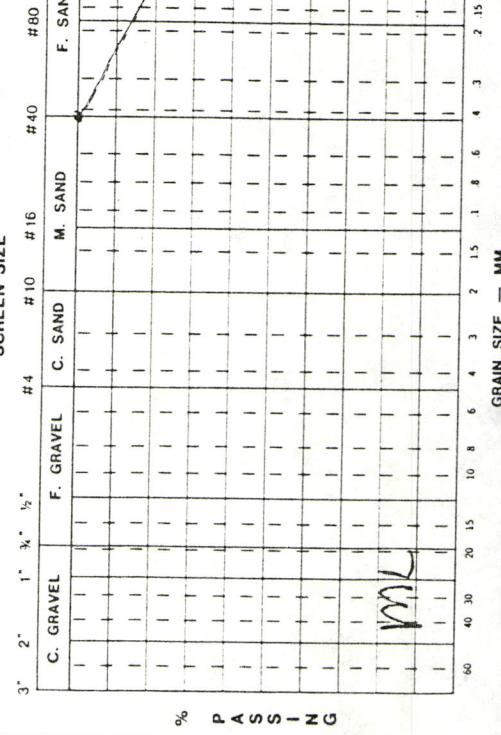
TEST	SAND	SILT	CLAY
VISUAL	L	L	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>6032-S</i> , MOIST, FINE Silty			
SILT			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PI =



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

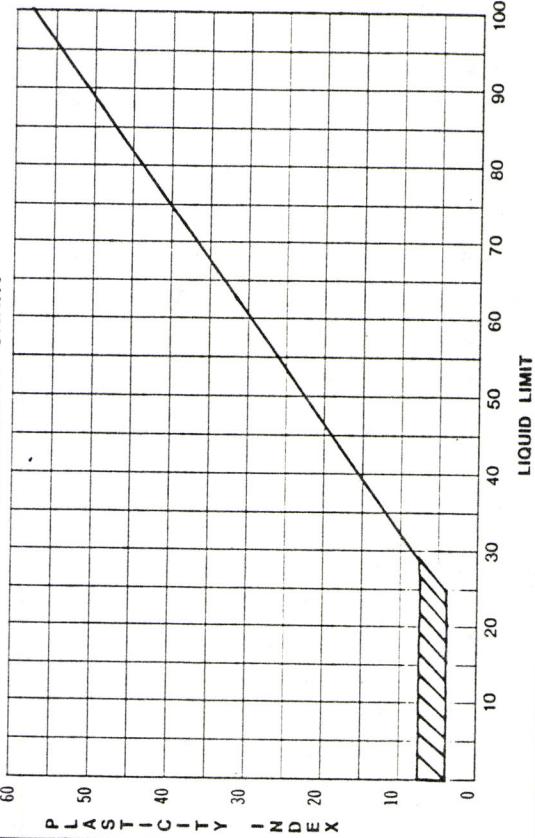
SAMPLE NO. 6032-6 JOB NO. Rb-2024 HOLE NO. /

DATE 5-7-65 OPERATOR J.M.

SOIL FIELD IDENTIFICATION

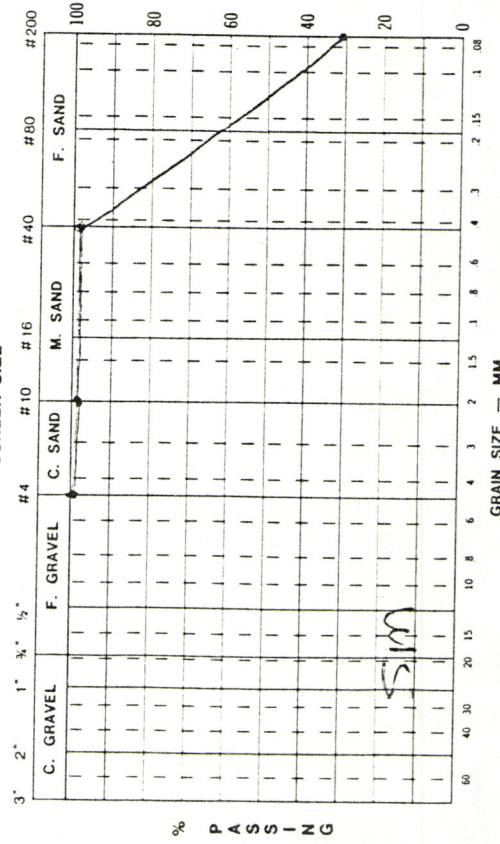
TEST	SAND	SILT	CLAY
VISUAL	✓	L	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Loamy moist soil with silty, fine sand particles</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			
Blows			
PL =			
PI =			



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

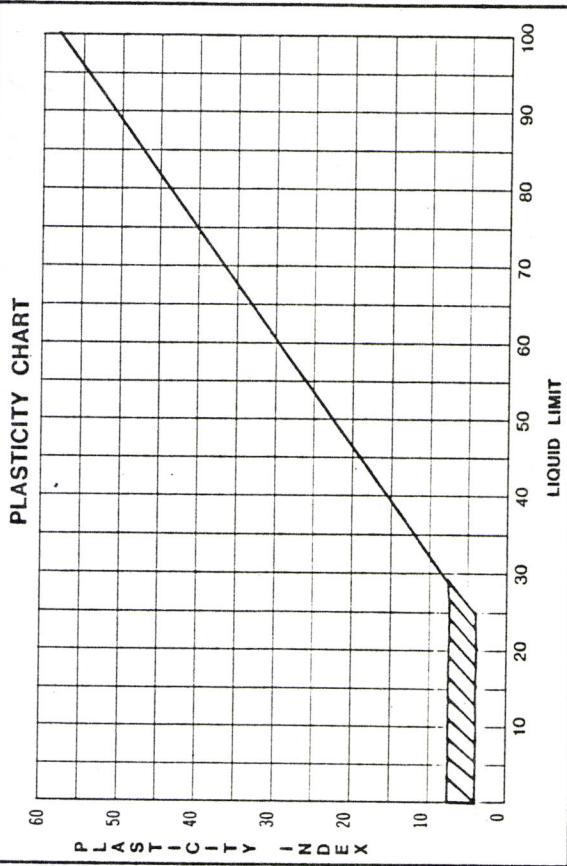
A-LINE

SAMPLE NO. 6032-7 JOB NO. 60-2027 HOLE NO. 1

DATE 5-9-65 OPERATOR Jim

SOIL FIELD IDENTIFICATION

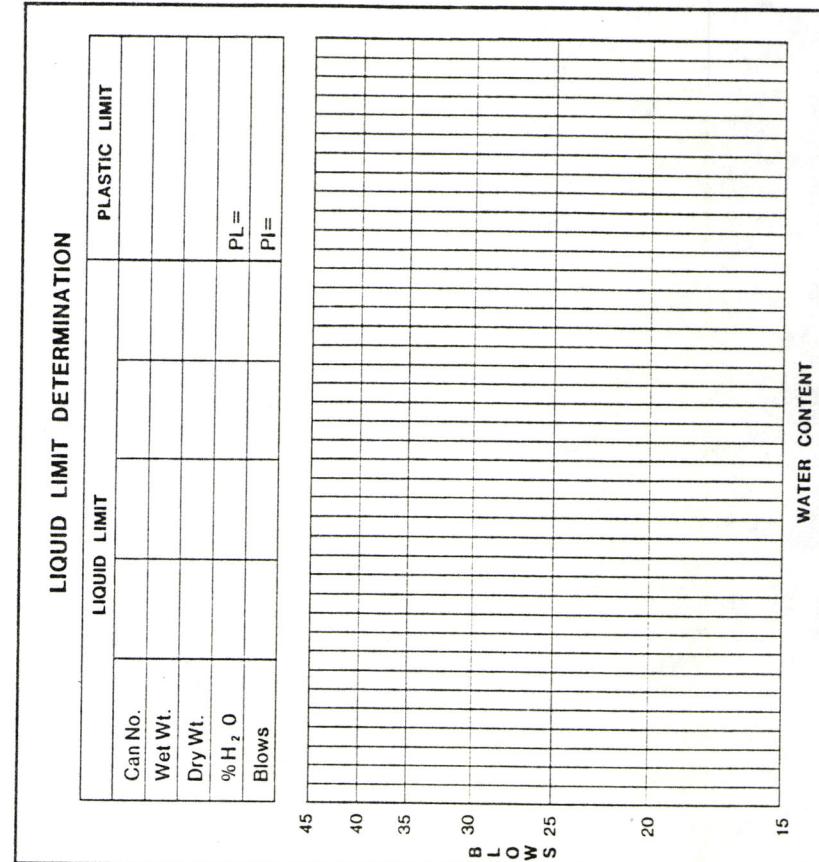
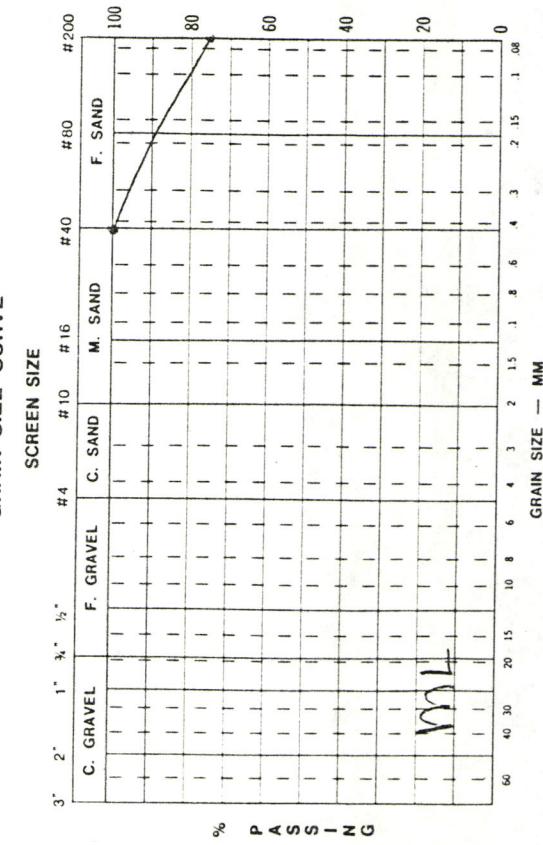
TEST	SAND	SILT	CLAY
VISUAL	✓		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Loamy, moist, fine sandy silt</i>			



6032-7 Sieve Analysis % Passing 100-40

-3½	80
-4	44.35
-10	13.705

GRAIN SIZE CURVE



WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)

1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Olympia

Date 5/3/85

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples.

Contract or PO-2029 Section KINGSTON FERRY TERMINAL
Job No. SR No. Sub-Section

Station & HQ-2 ON LAYOUT
Offset

Hole # HQ-2

E Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
	<u>D-1</u>	<u>0' 2'</u>			
6031-1	D-2	5'-7'	<u>1820=</u> <u>27.4%</u>	ML	
-2	D-3	11'-12'	<u>25.3%</u>	ML	
-3	D-4	16'-17.5'	<u>21.7%</u>	Sm	
-4	D-5	20'-21.5'			LK 6031-3
-5	D-6	25'-26.5'			LK 6031-3
-6	D-7	30'-31.5'	<u>23.9%</u>	Sm	
-7	D-8	35'-36.5'	<u>17.1%</u>	Sm	

I copy with samples
I copy to addressee

Yours very truly,

C.J. Scoville
Inspector

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

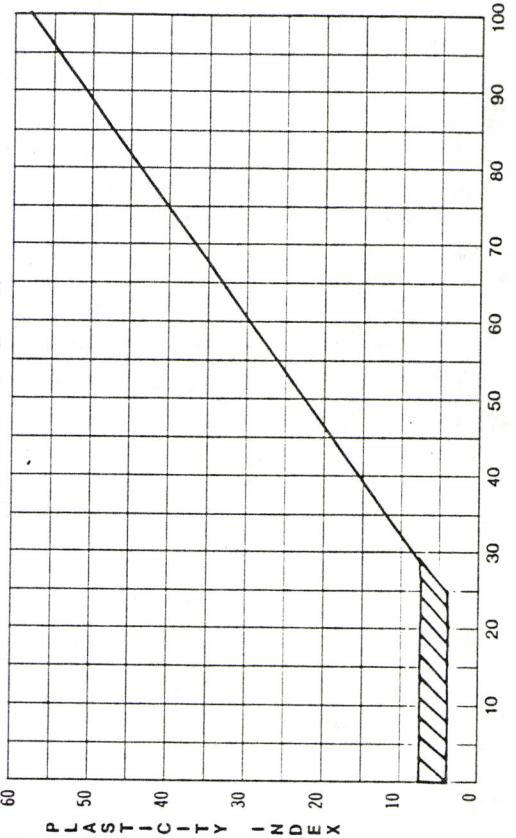
SAMPLE NO. 603/- JOB NO. 80-2621 HOLE NO. 2

DATE 5-9-65 OPERATOR Am

SOIL FIELD IDENTIFICATION

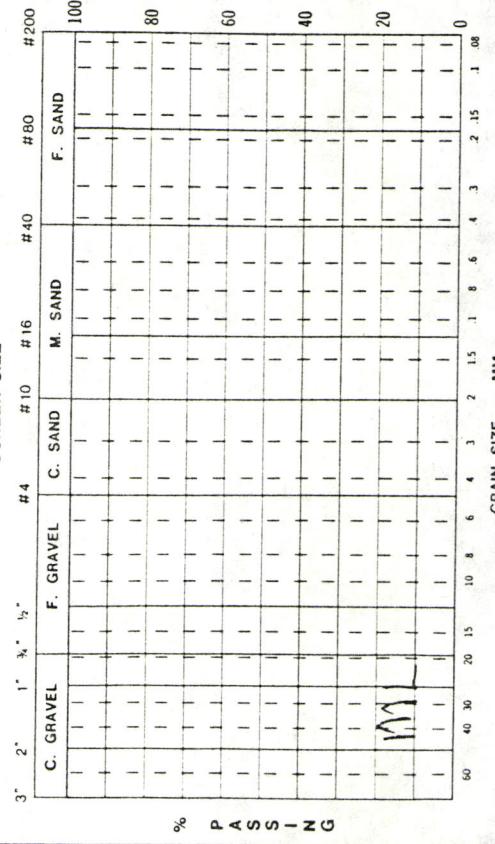
TEST	SAND	SILT	CLAY
VISUAL		✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Fine, moist sand-silt</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PI =



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

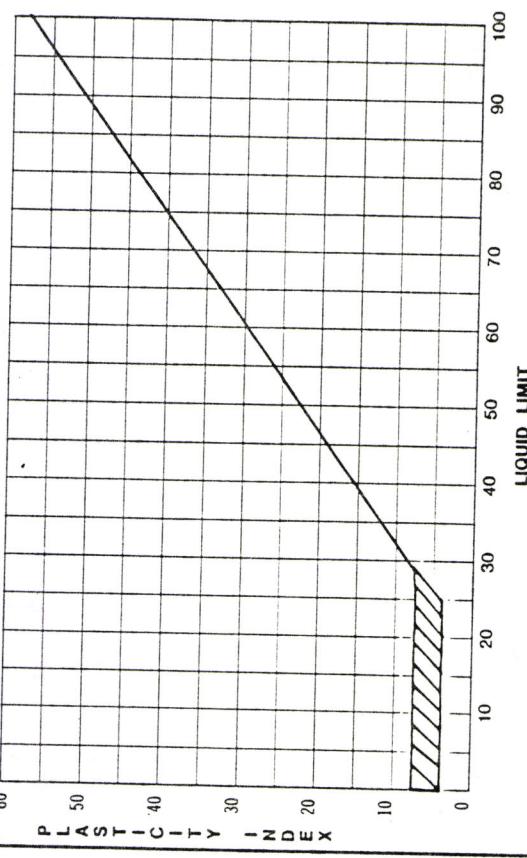
SAMPLE NO. 6031-2 JOB NO. 222 HOLE NO. 2.

DATE 5-9-85 OPERATOR Jm

SOIL FIELD IDENTIFICATION

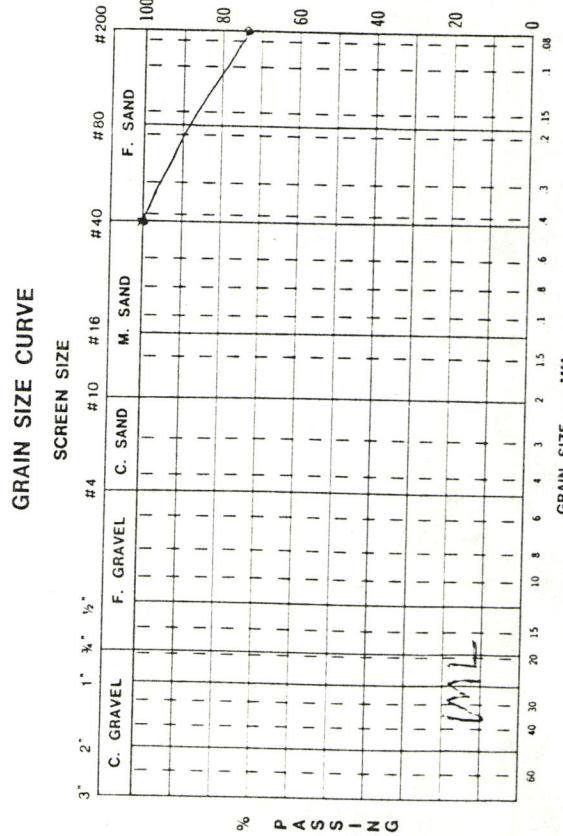
TEST	SAND	SILT	CLAY
VISUAL	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRIED CAST	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DILATANCY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BITE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TOUGHNESS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESCRIPTION: <i>Firm, moist, fine sand</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

Can No.	LIQUID LIMIT			PLASTIC LIMIT
	Wet Wt.	Dry Wt.	% H ₂ O	
				PL =
				PI =



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

SAMPLE NO. 6031-3 JOB NO. 6021 HOLE NO. 2

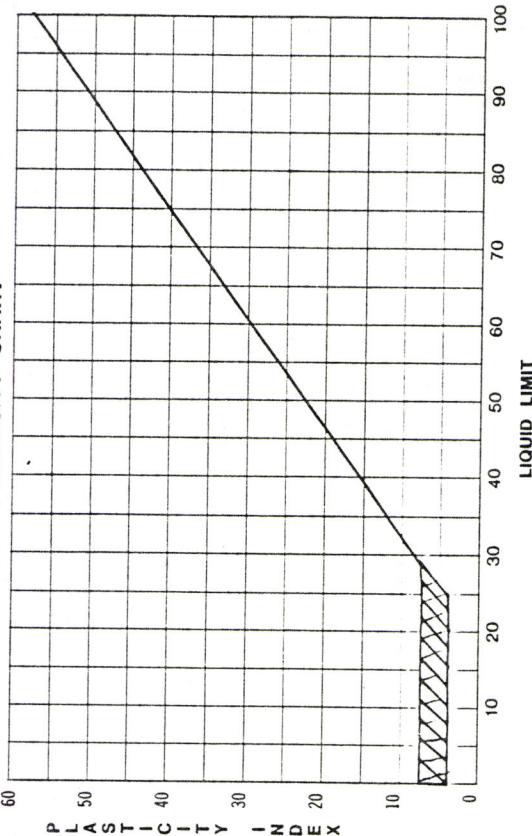
DATE 5-9-85 OPERATOR Jim

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

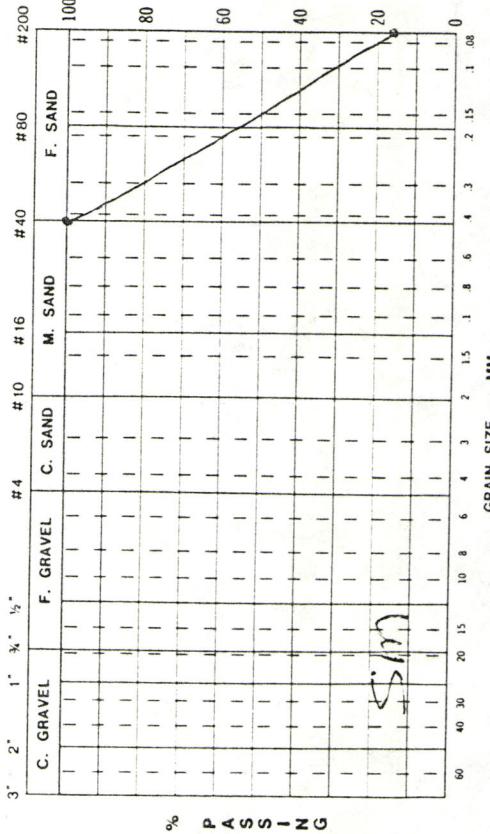
DESCRIPTION: Creamy-fine moist,
-sticky, fine sand,

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PL =



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

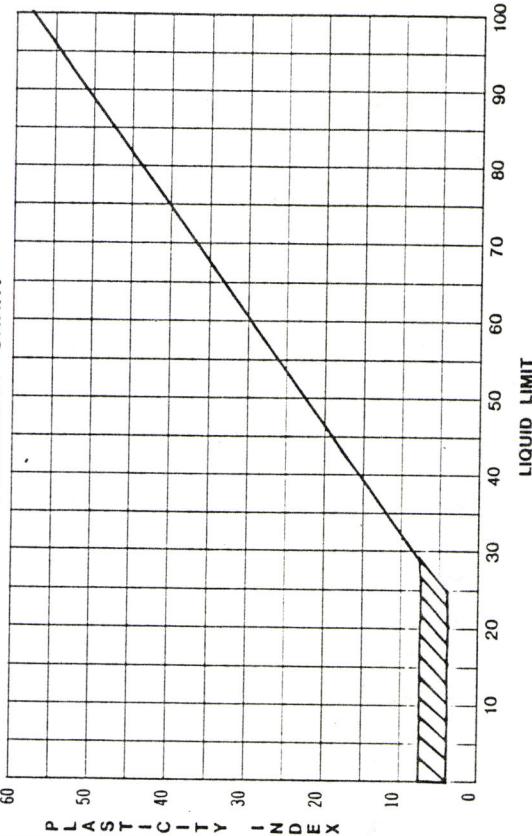
SAMPLE NO. 6031-*i* JOB NO. 10-2521 HOLE NO. 2

DATE 5-9-85 OPERATOR *Jr*

SOIL FIELD IDENTIFICATION

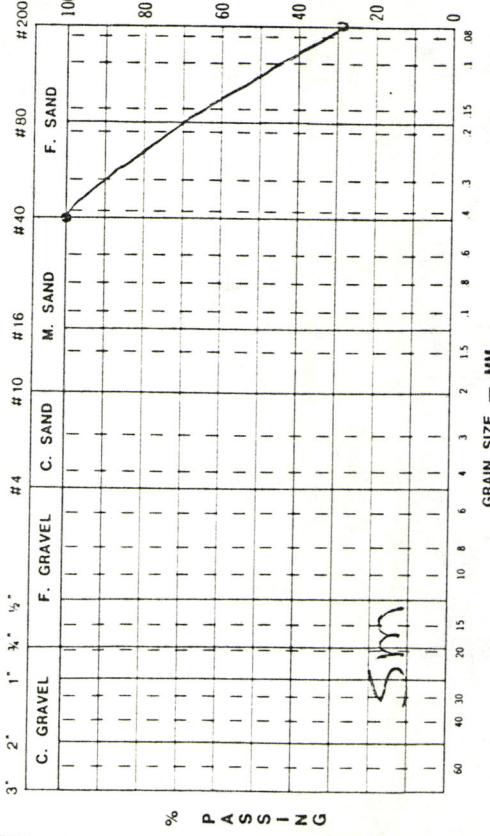
TEST	SAND	SILT	CLAY
VISUAL	<input checked="" type="checkbox"/>		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Chesty, moist, silty, fine sand.</i>			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PI =



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

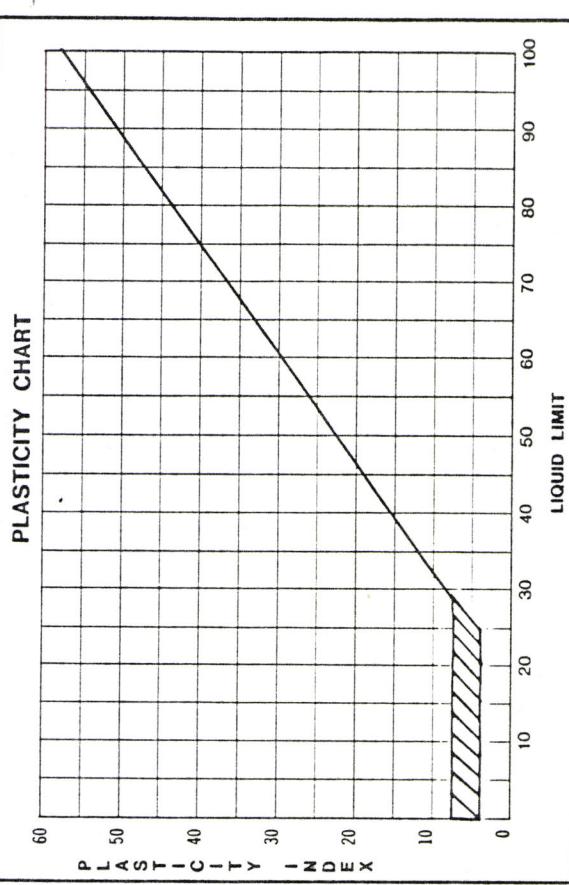
SAMPLE NO. 6X31-7 JOB NO. 60-222 HOLE NO. 2

DATE 5-9-85 OPERATOR Jm

SOIL FIELD IDENTIFICATION

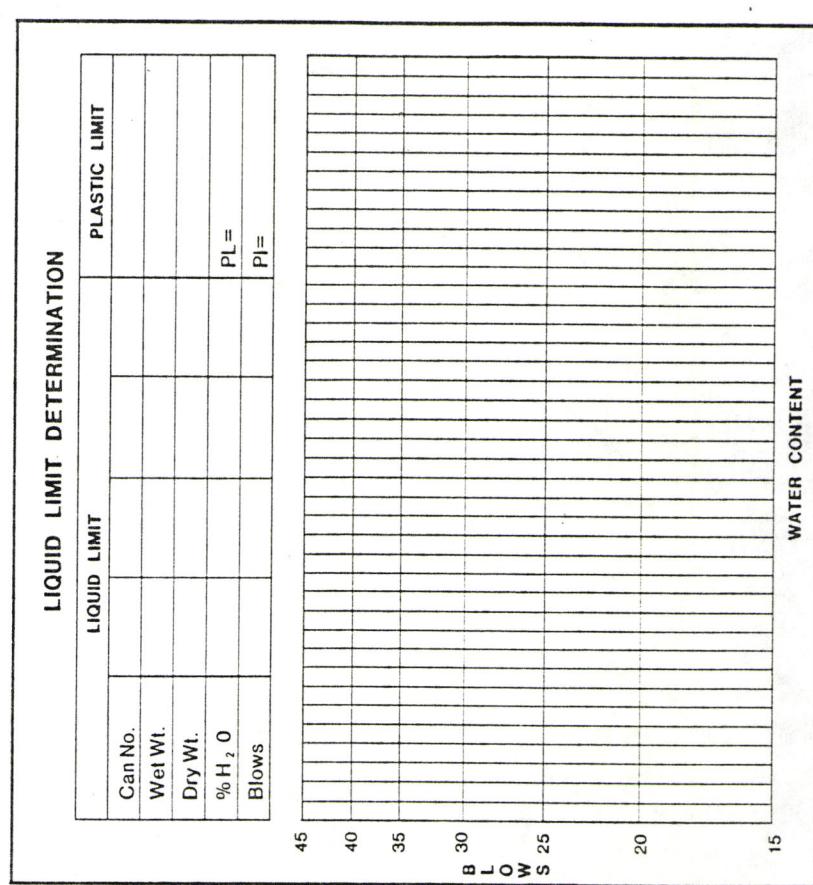
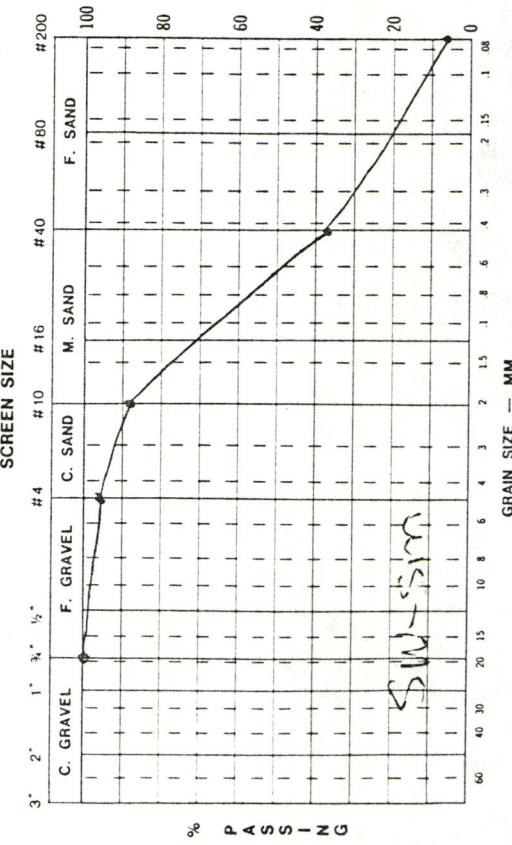
TEST	SAND	SILT	CLAY
VISUAL	✓		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

DESCRIPTION: *CUT EYE, MOIST SILT, FINE GRAVELY, FEW CLAY ING.*



SIEVE ANALYSIS % Passing		LIQUID LIMIT		PLASTIC LIMIT	
-34	11.4.2. 100	-40	95.90	36.6	
-4	26.68 96.15	-80			
-10	16.1.4.0 88.1	-140	200	23.4.0	7.2

GRAIN SIZE CURVE



WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)
1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Olympia.....

Date 5/3/85

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples.

Contract or
Job No. PO-2029

Section KingsTah Ferry Terminal
SR No. Sub-Section

Station
&
Offset HQ-3 on Layout

Hole # HQ-3

E Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
6030-1	D-1	0'-2'	120 25.2%	SP	
-	D-2	5'-6.5'	NOT RECEIVED		
-2	D-3	9'-11'	26.5%	ML	
-3	D-4	14'-16'	27.1%	ML	
-4	D-5	19'-20.5'		LK 6030-3	
-5	D-6	25'-26.5'		LK 6030-3	
-6	D-7	32'-33.5'	20.8%	SP Sm	

I copy with samples
I copy to addressee

Yours very truly,

C.H. Scoville

Inspector.

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

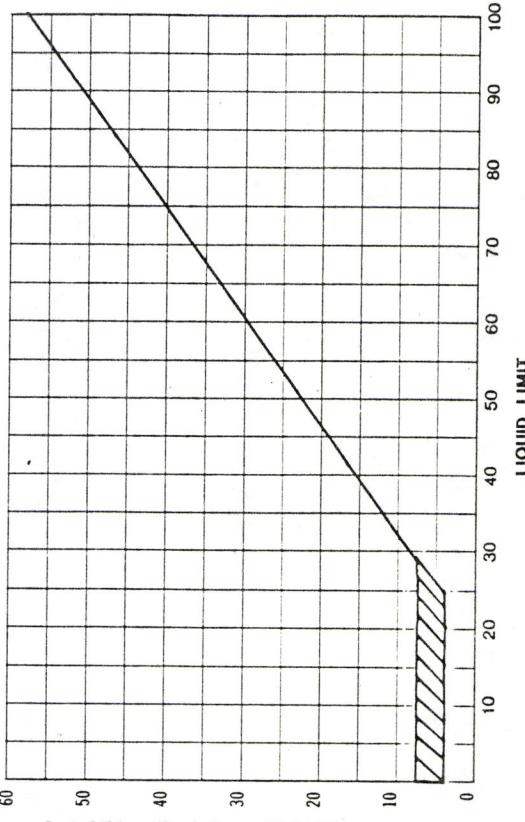
SAMPLE NO. 6022r1 JOB NO. R2-2021 HOLE NO. 3

DATE 5-7-65 OPERATOR Jim

SOIL FIELD IDENTIFICATION

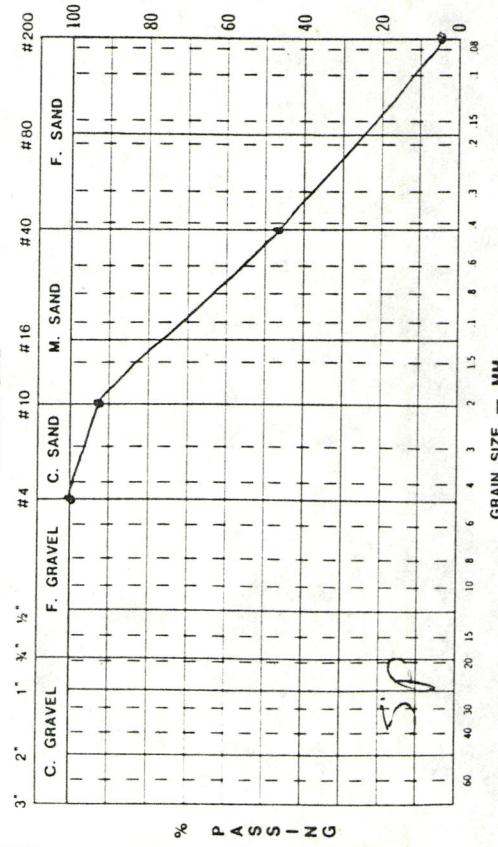
TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>(Loamy) moist, sh. silty</i>			
F-C SPEND			

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			
Blows			
PL =			
PI =			



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

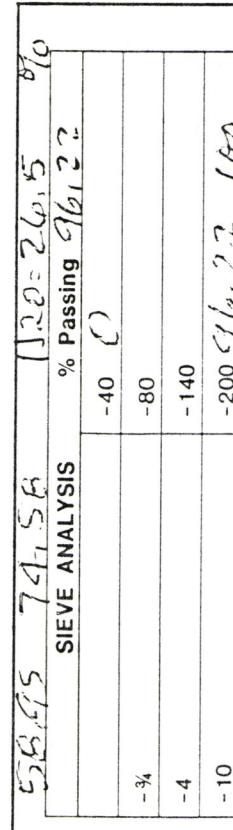
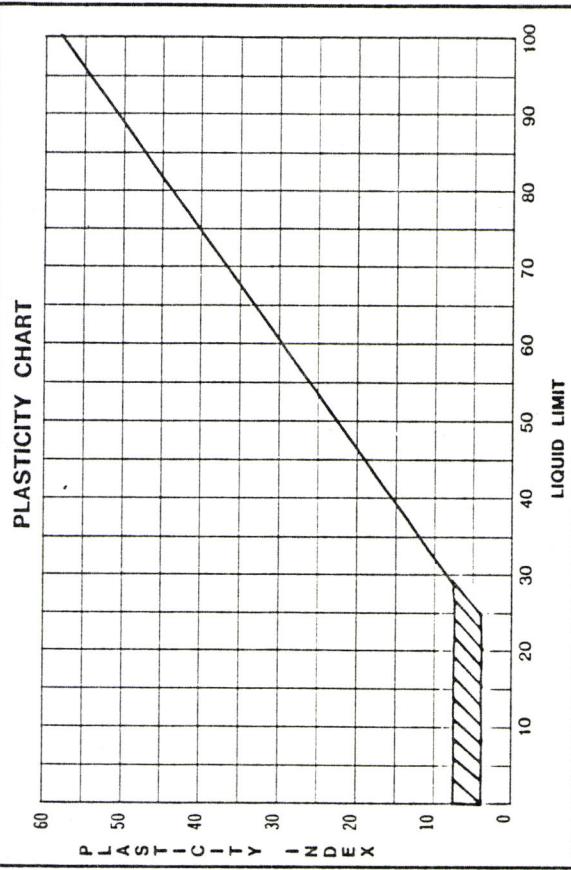
A-LINE

SAMPLE NO. 2030-2 JOB NO. 2224 HOLE NO. 3

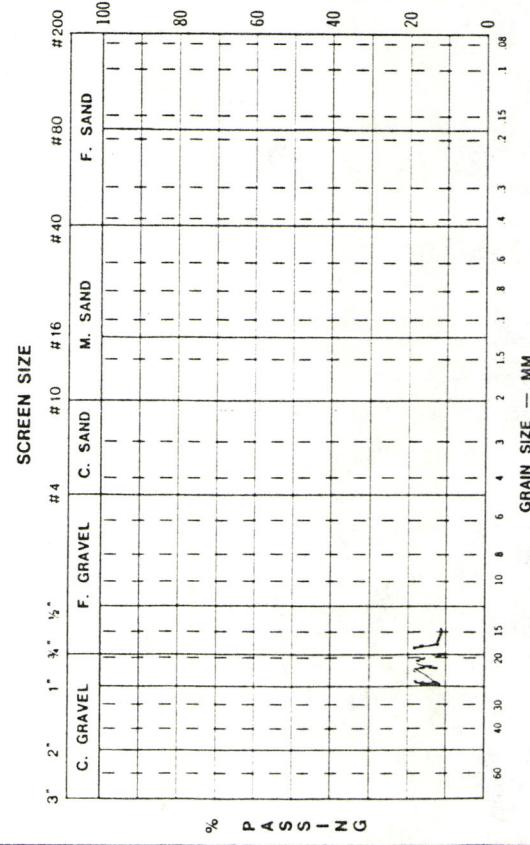
DATE 5-17-65 OPERATOR Jim

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL		✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Loamy-Silt, Muddy Silt</i>			



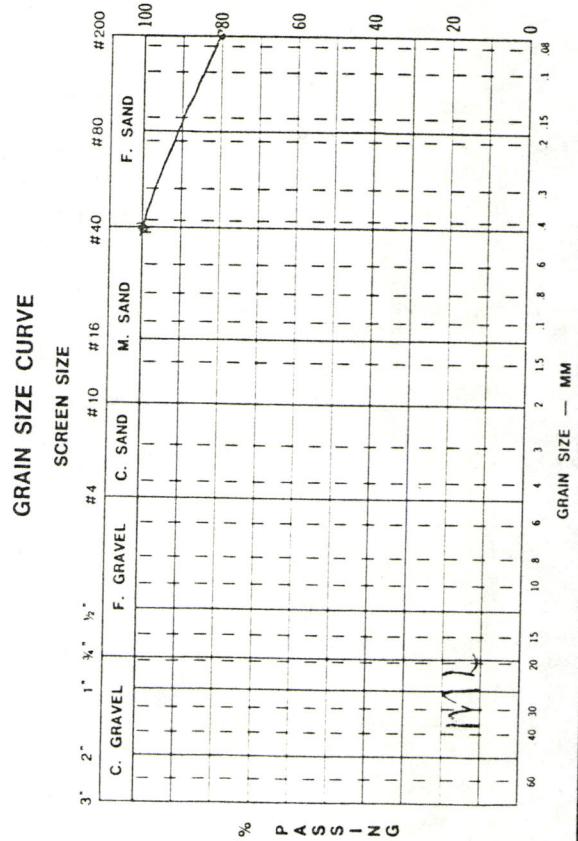
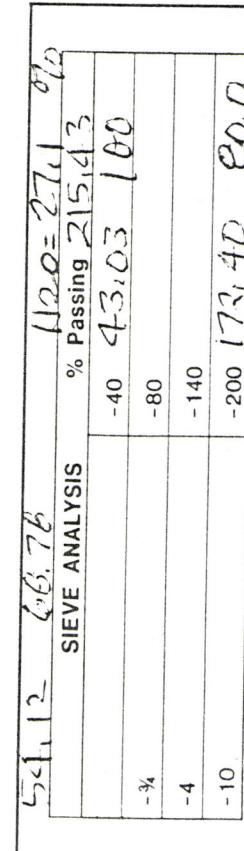
GRAIN SIZE CURVE



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

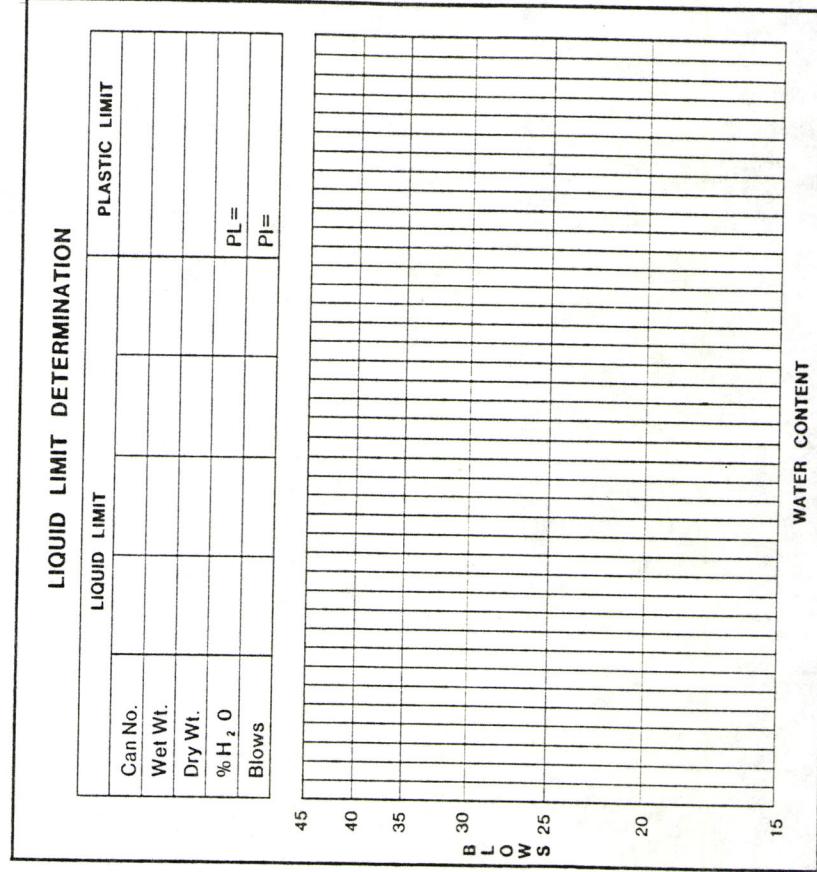
A-1115

SAMPLE NO. 66-16-3		JOB NO. 66-2627		HOLE NO. 3
DATE	5-9-65	OPERATOR Jim		
SOIL FIELD IDENTIFICATION				
TEST	SAND	SILT	CLAY	
VISUAL	✓	✓		
DRIED CAST				
DILATANCY				
BITE				
TOUGHNESS				
DESCRIPTION:	GLEY, MOIST, FINE SILTY			



PLASTICITY CHART

Liquid Limit (%)	Plastic Limit (%)
60	0
50	10
40	20
30	30
20	40
10	50
0	60



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

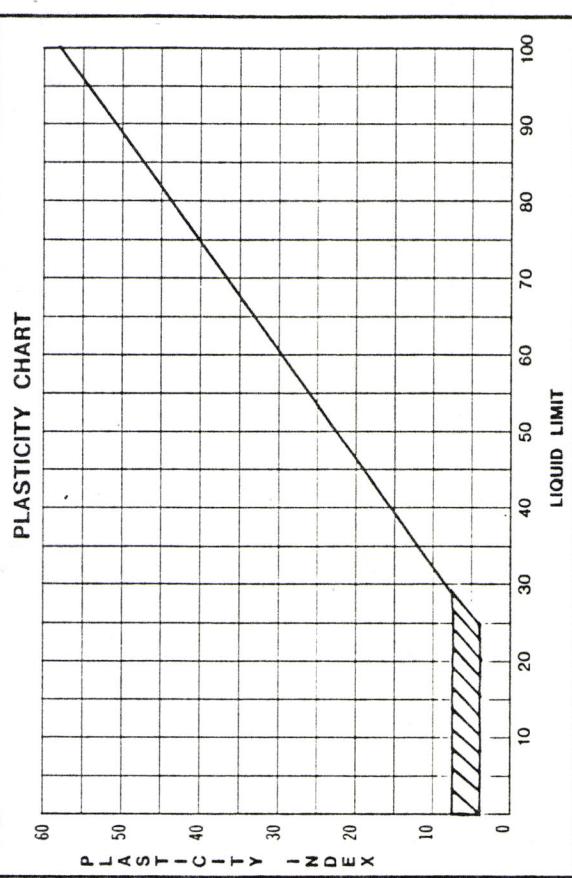
SAMPLE NO. 6030-6, JOB NO. 1024 HOLE NO. 3

DATE 5-1-85 OPERATOR Jm

SOIL FIELD IDENTIFICATION

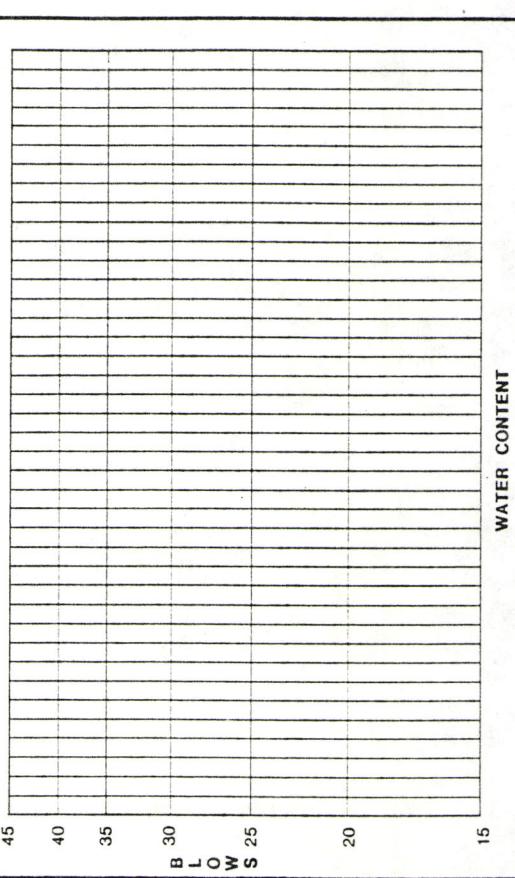
TEST	SAND	SILT	CLAY
VISUAL	-	-	✓
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

DESCRIPTION: ~~Clean~~ ~~gravelly~~ Sh. Silt Y



LIQUID LIMIT DETERMINATION

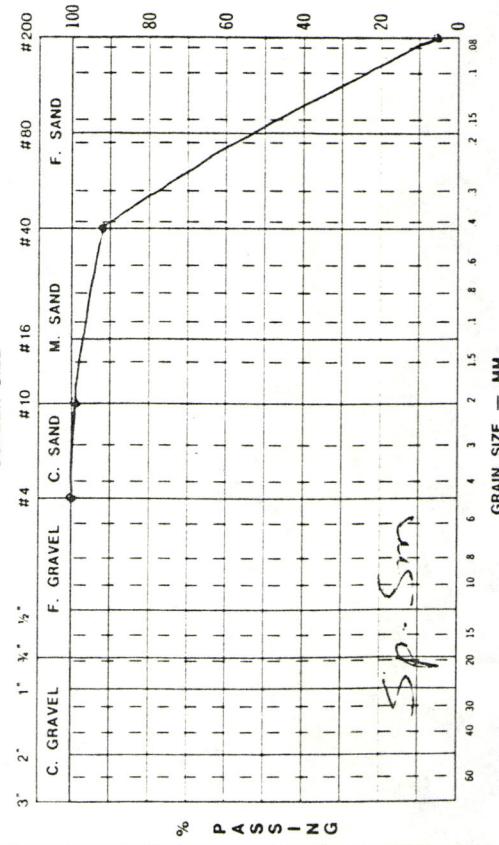
LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PI =



3. SIEVE ANALYSIS % Passing

Screen Size	-3 ₄	-2 ₁	-1 ₀	-4 ₀	-80
C. GRAVEL	0	100	100	100	100
F. GRAVEL	0	100	100	100	100
#4	0	0	0	0	0
#10	0	0	0	0	0
#16	0	0	0	0	0
#40	0	0	0	0	0
#80	0	0	0	0	0
F. SAND	0	0	0	0	0

GRAIN SIZE CURVE



WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER
Materials Laboratory
P. O. Box 167, Olympia, WA 98504 (Mailing Address)
1655 So. 2nd Ave.
Tumwater, Washington 98504 (Shipping Address)

Place Olympia
Date 5/3/85

Dear Sir:

I have forwarded by today's Delivered the following Foundation Samples.

Contract or
Job No. PO-2029

Section Kingston Ferry Terminal
SR No. Sub-Section

Station &
Offset HQ-4 40' North on Layout

Hole # HQ-4

E Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description	
					SW	Sm
6029-1	D-1	3'-5'	1920 17.5%	ML		
-2	D-2	9'-10.5'	23.9%	ML		
-3	D-3	15'-16.5'	21.3%	SP Sm		
-4	D-4	20'-21.5'	22.4%	Sm		
-5	D-5	25'-27'	26.9%	ML		
-6	D-6	30'-31.5'	21.8%	SP		
-7	D-7	35'-36.5'			LK. 6029-6	
	D-8	37'-40.5'				

y with samples
y to addressee

Yours very truly,

C.N. Scoville

Inspector.

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

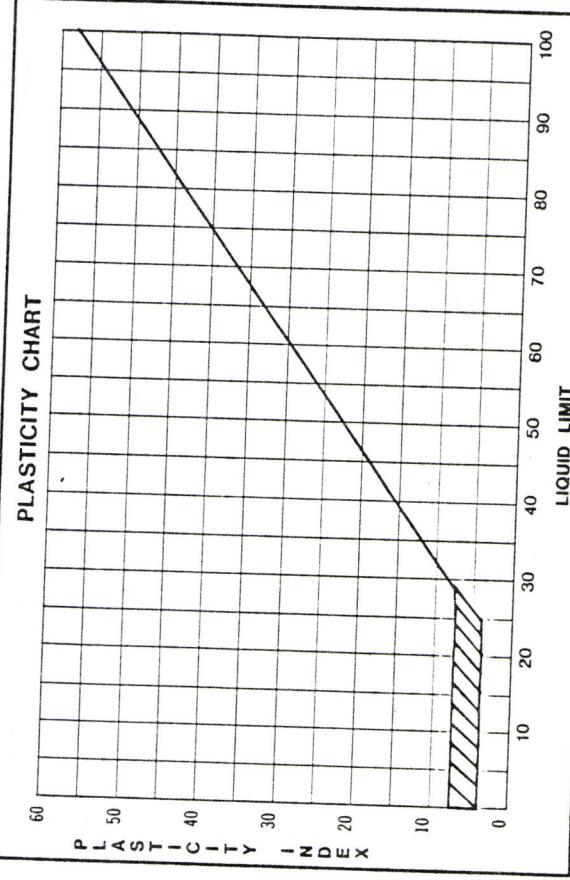
A-LINE

SAMPLE NO. 66447-1 JOB NO. R0-26274 HOLE NO. 4

DATE 07-9-55 OPERATOR J. J.

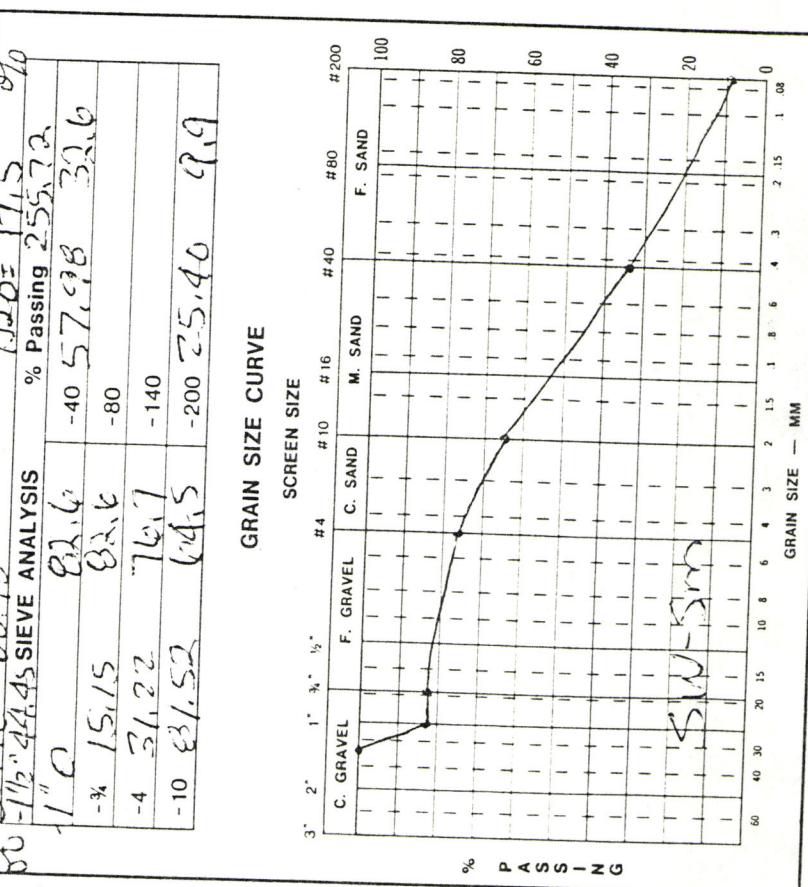
SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	✓
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Loamy, moist, silty sand, with shells</i>			



ST 56.70 68.92
1 1/2" 44.45 SIEVE ANALYSIS % Passing 17.5 87.2

Screen Size	% Passing
1 1/2"	87.2
1 1/4"	57.98
1 1/8"	32.6
-4	14.7
-10	2.5, 4.0
-10	0.9



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

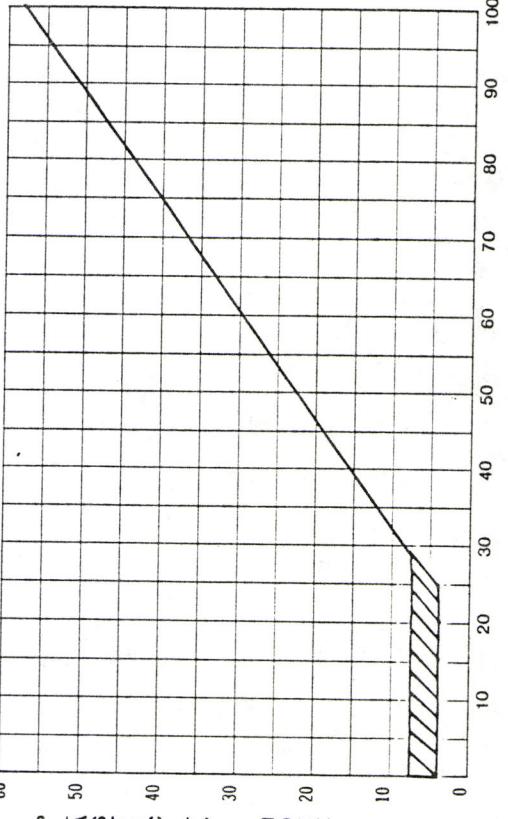
SAMPLE NO. C-2 JOB NO. 2 HOLE NO. 4

DATE 5-9-65 OPERATOR J. J.

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	L		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: MEDIUM, FINE SANDY SILT			

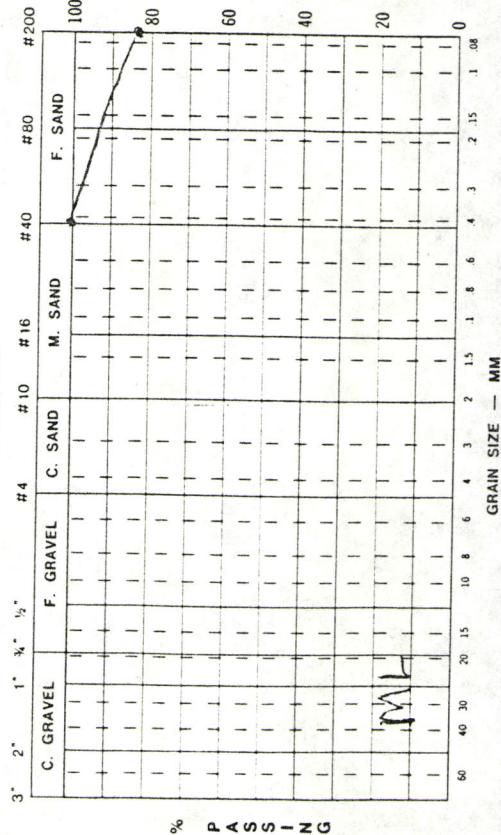
PLASTICITY CHART



LIQUID LIMIT DETERMINATION

Can No.	LIQUID LIMIT			PLASTIC LIMIT		
	Wet Wt.	Dry Wt.	% H ₂ O	Blows	PL	PI
-40	30	12	100			
-80						
-140						
-200	155	25	32.4			

GRAIN SIZE CURVE



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

SAMPLE NO. 6021-3 JOB NO. RL-2029 HOLE NO. 4

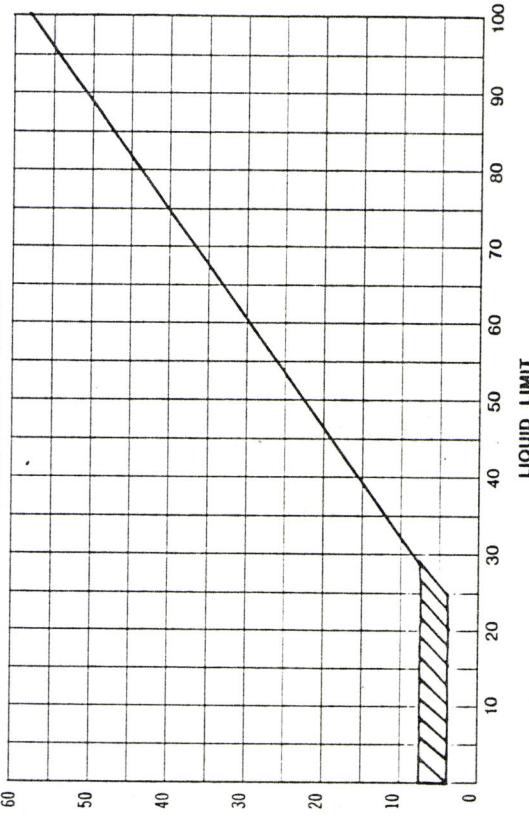
DATE 5-9-85 OPERATOR Jm

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓		
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

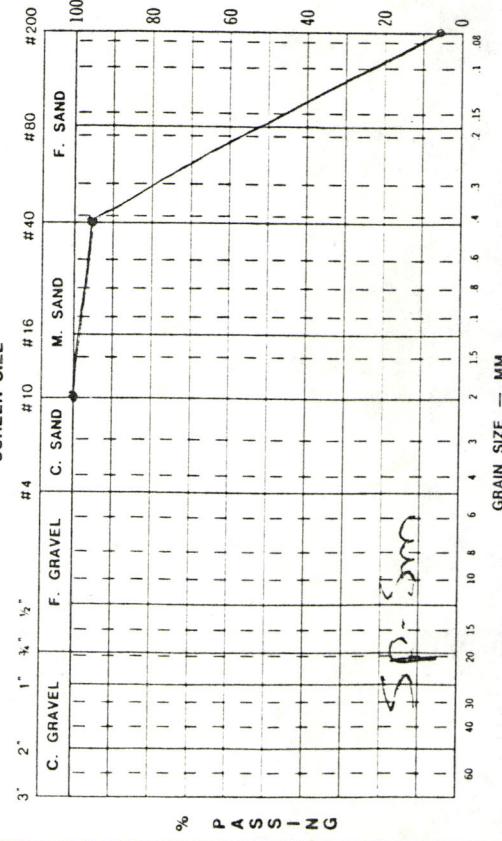
DESCRIPTION: *Dark Mottled Sh. Silty, fine sand, 10-15%*

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O		PL =	
Blows		PI =	



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

SAMPLE NO. 60X1-4 JOB NO. 10-20X1 HOLE NO. 4

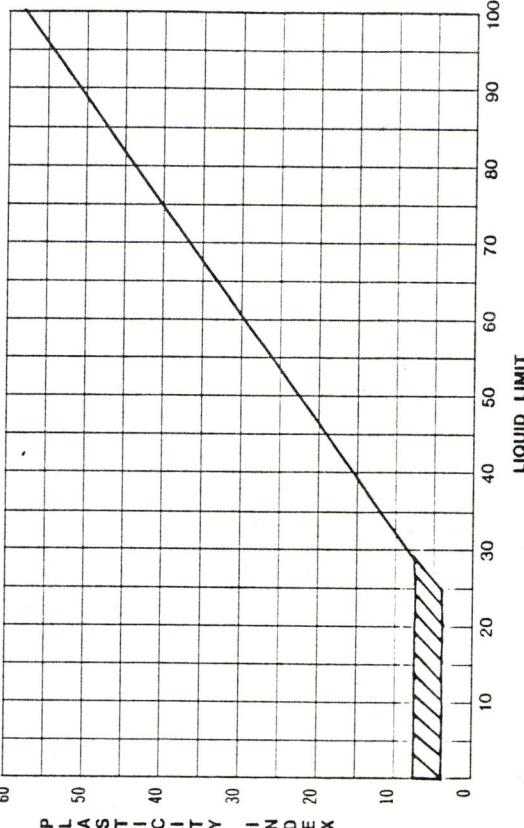
DATE 5-7-65 OPERATOR J. J.

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

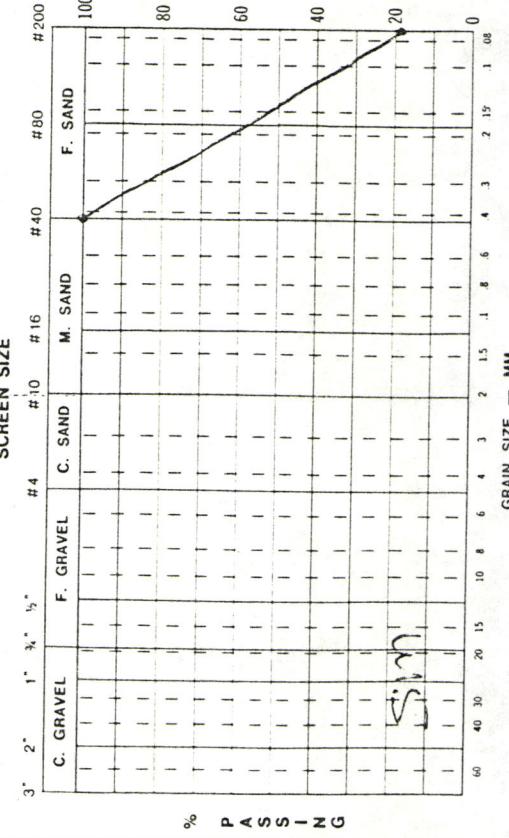
DESCRIPTION: Loamy, moist, silty, fine sand

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O		PL =	
Blows		PI =	



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

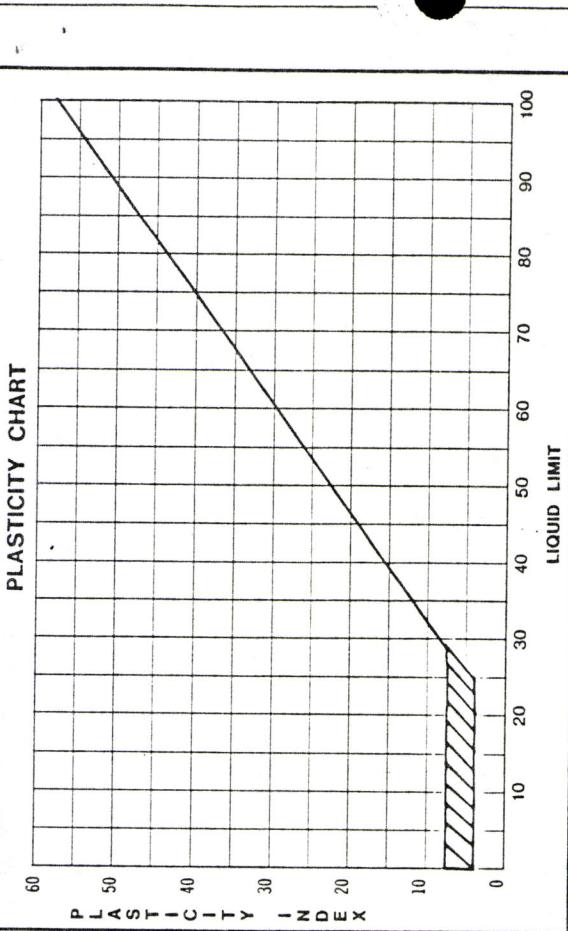
A-LINE

SAMPLE NO. 60001-5 JOB NO. R02021 HOLE NO. 4

DATE 5-7-65 OPERATOR Jim

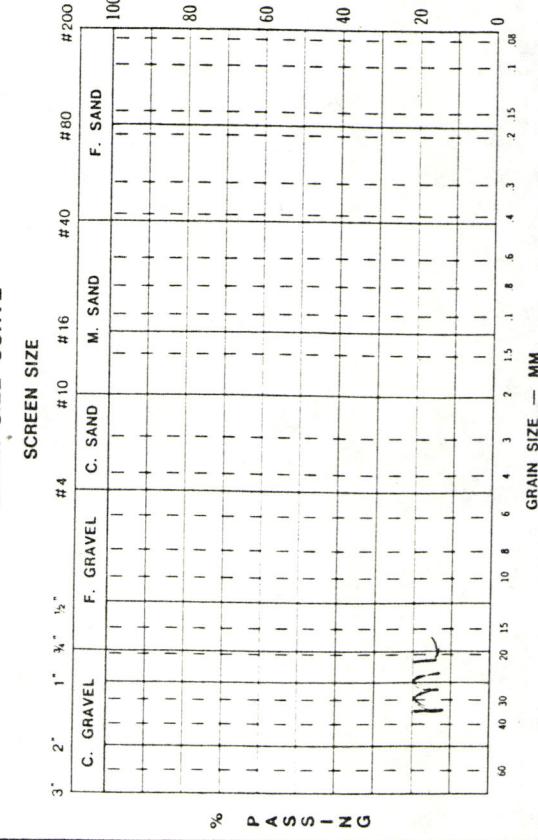
SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL		✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			
DESCRIPTION: <i>Loamy, moist, Silt</i>			



SIEVE ANALYSIS % Passing 102.65	
-3 ₄	-40 C
-4	-80
-4	-140
-10	-200 102.65 100

GRAIN SIZE CURVE



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

A-LINE

SAMPLE NO. 60029-6 JOB NO. RD-2427 HOLE NO. 4

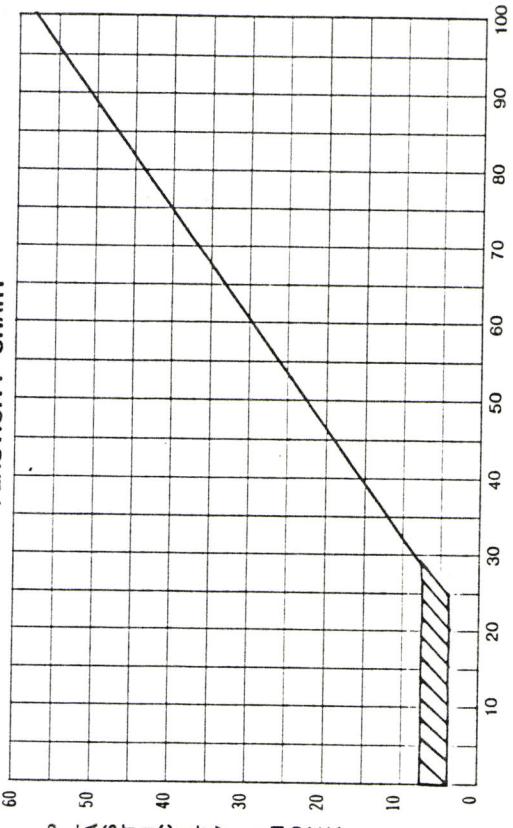
DATE 5-9-65 OPERATOR Jm

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST			
DILATANCY			
BITE			
TOUGHNESS			

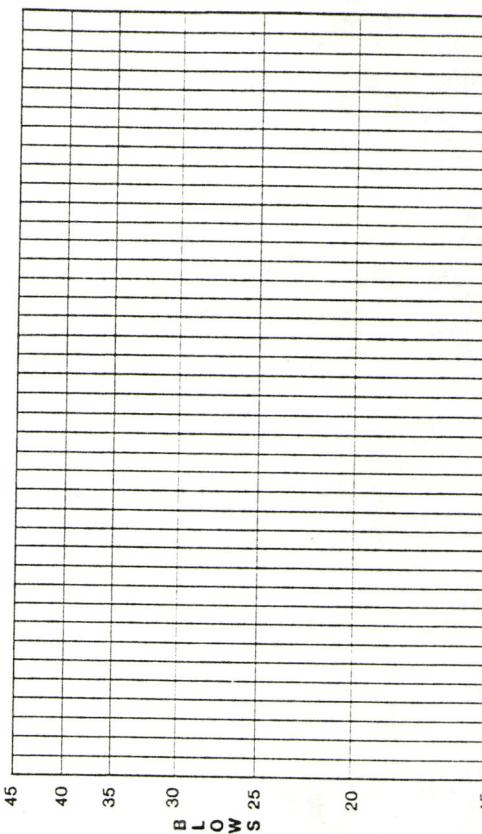
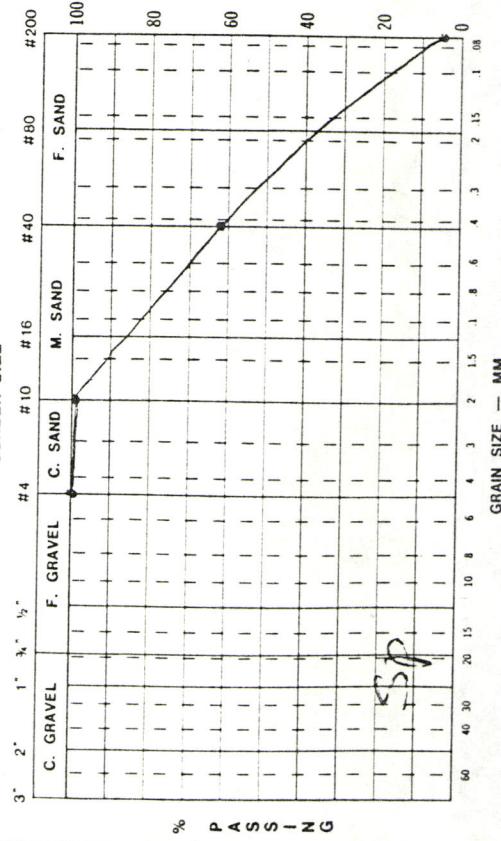
DESCRIPTION: Chesty moist, St, Silty, sand

PLASTICITY CHART



LIQUID LIMIT DETERMINATION

LIQUID LIMIT		PLASTIC LIMIT	
Can No.			
Wet Wt.			
Dry Wt.			
% H ₂ O			PL =
Blows			PI =



SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

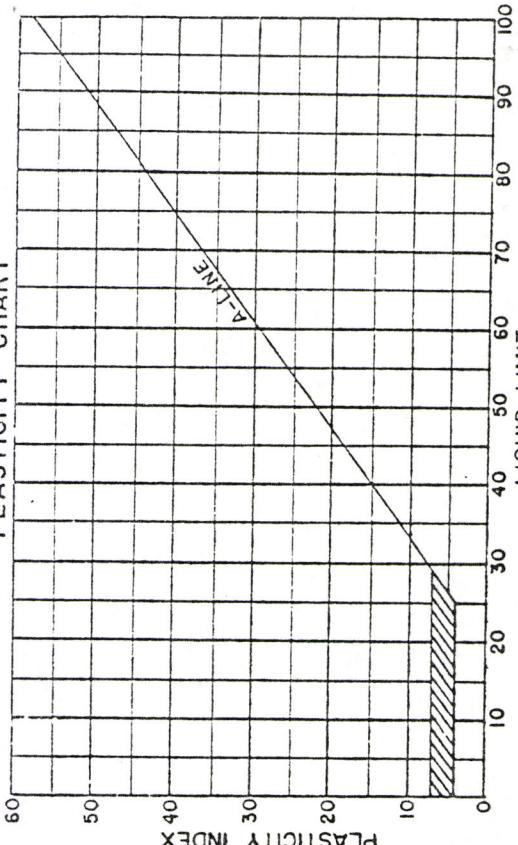
SAMPLE NO. 4952-4 JOB NO. HOLE NO. H-4
DATE 10/10/82 OPERATOR AS

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	

DESCRIPTION: Moist, grey, fine gravelly, V. S. / hy, E-C Sand

PLASTICITY CHART

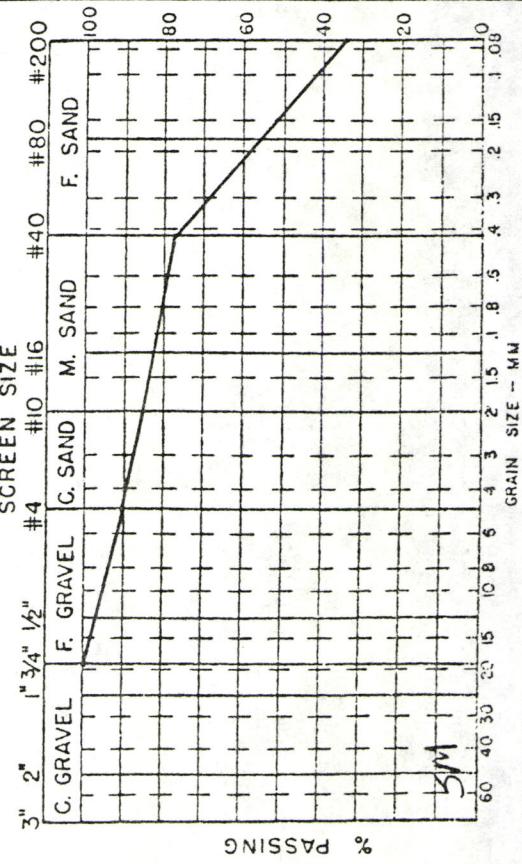


27.63 30.73 131.50

SIEVE ANALYSIS % Passing

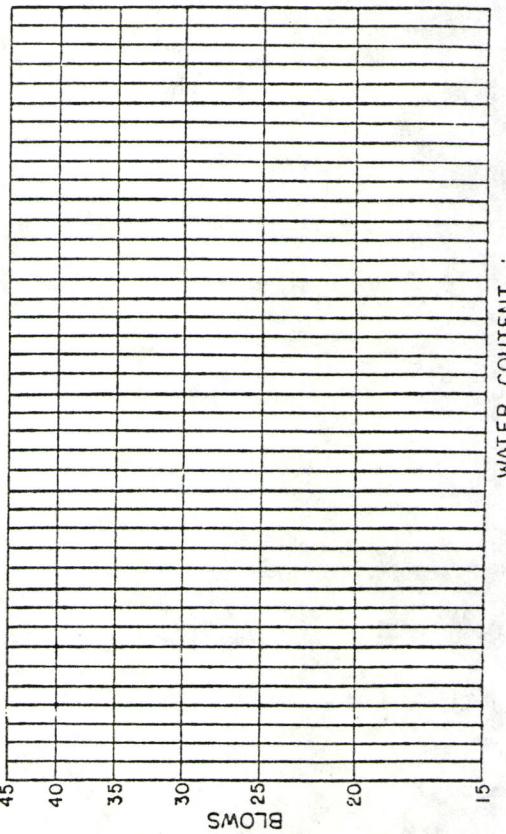
-40	35.5	97.5
-3/4 12.52	100%	-80
-4 5.22	20.5	-140
-10 1.90	86.5	-200 45.89 34.9

GRAIN SIZE CURVE



% PASSING

LIQUID LIMIT DETERMINATION	
	Liquid Limit
Can No.	
Wet Wt.	
Dry Wt.	
% H ₂ O	
Blows	
PL=	
PI=	



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

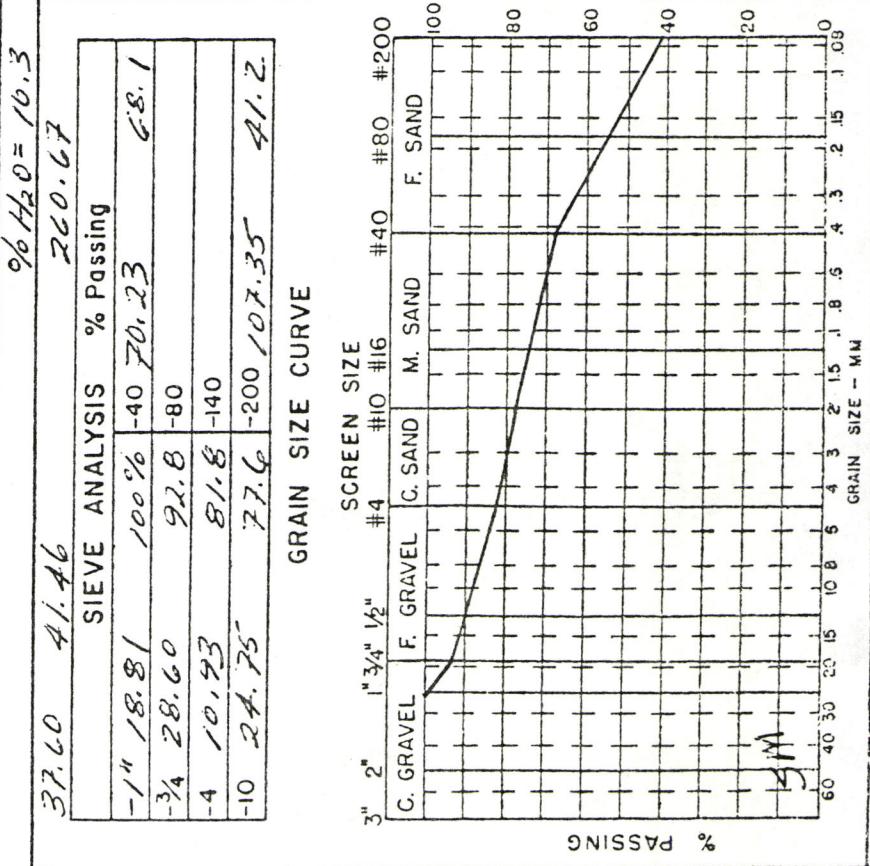
SAMPLE NO. 4956-5 JOB NO. HOLE NO. H-4

DATE 10/6/01 S3 OPERATOR AS

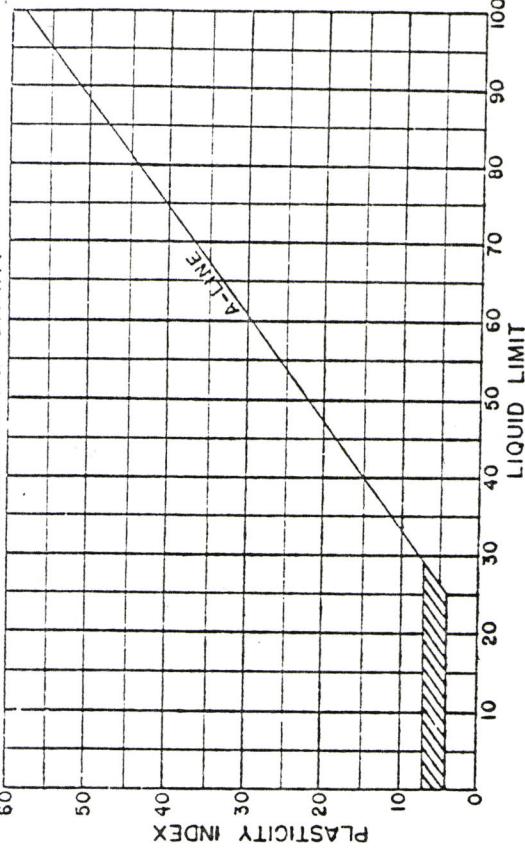
SOIL FIELD IDENTIFICATION

TEST	CLAY	SILT	SILT	SAND	TEST
VISUAL		✓	✓		
DRIED CAST		✓	✓		
DILATANCY					
BITE					
TOUGHNESS		✓	✓		

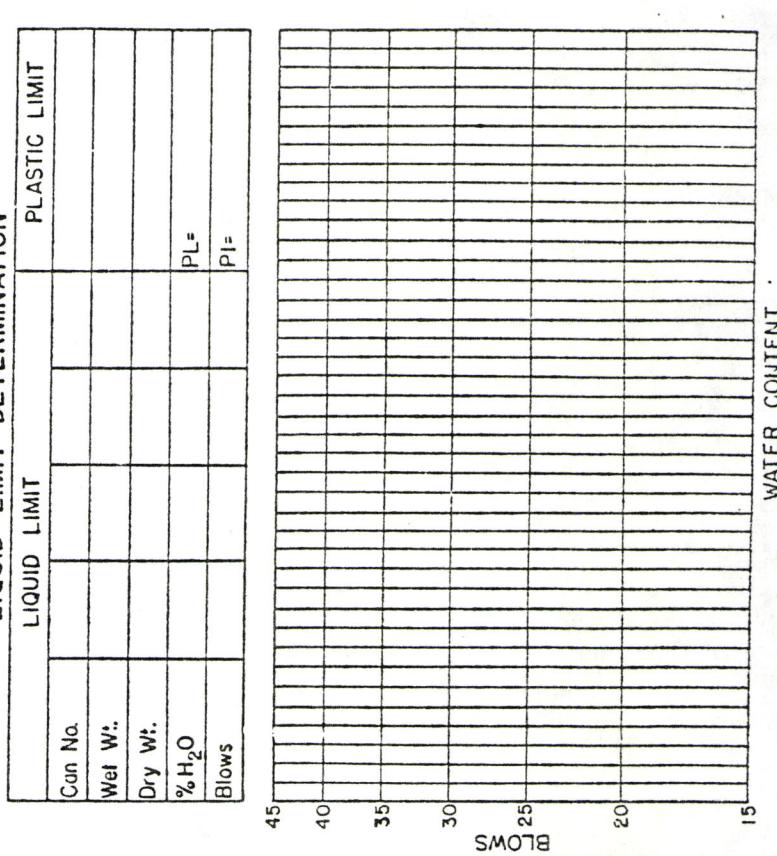
DESCRIPTION: /"(-) S.R., very Silty,
 F-C. Sand. (Wet, grey)



PLASTICITY CHART



LIQUID LIMIT DETERMINATION



32.68 41.16 % H₂O = 16.3
760.17

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

MATERIALS ENGINEER

Materials Laboratory

P. O. Box 167, Olympia, WA 98504 (Mailing Address)

1655 So. 2nd Ave.

Tumwater, Washington 98504 (Shipping Address)

Place Winslow, Wash.

Date Sept. 15, 1983

Dear Sir:

I have forwarded by today's the following Foundation Samples.

Contract or
Job No.

Section Winslow Ferry Dock

SR No. 305 Sub-Section

Station
&
Offset . 0+02, 26' RT.

Hole # H-5

Lab No.	Drive #	Depth	Tube Position in Sampler	Clas.	Description
4957 -1	D- 1	0.5' to 2.5'	10.5	SM	Moist, Grey, F. gravelly, V. silty, F-C Sand & Wood with some F. Sdy silt.
-2	D- 2	6.0' to 6.9'	10.5	SM	Moist, Grey, F. gravelly, V. silty F-C Sand
-3	D- 3	11.0' to 12.0'	18.6	ML	Wet, Brown-Grey, F-C Sandy silt w/ Trace of F. gravel
-4	D- 4	16.0' to 16.9'	10.9	SM	Moist, Grey, 1" (-) S.R., V. silty, F-C Sand
-5	D- 5	19.6' to 20.0'			Same
-6	D- 6	24.9' to 25.4'	11.2	GM	Moist, Grey, V. silty, F-C Sandy, 1 1/2" (-) S.R. gravel

1 copy with samples

1 copy to addressee

Yours very truly,

James P. Lance

Inspector.

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

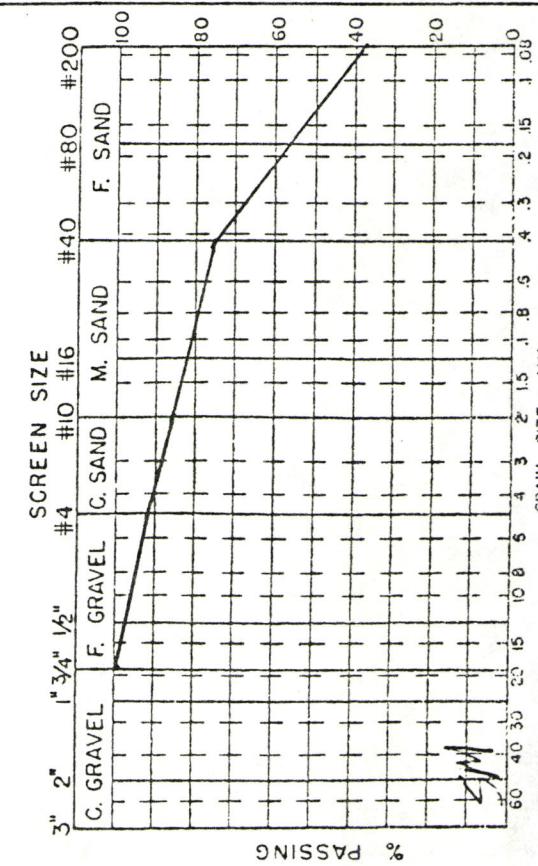
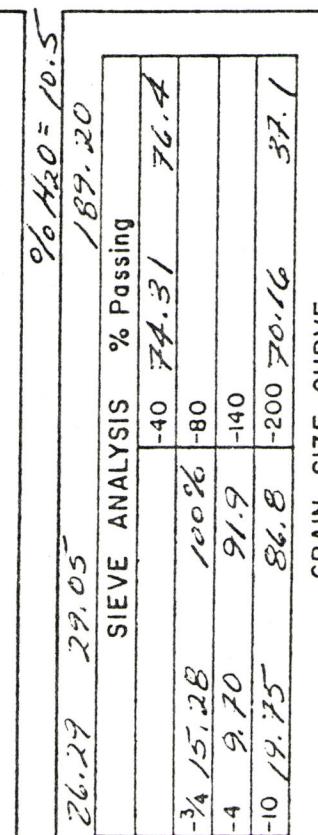
SAMPLE NO. #957-2 JOB NO. HOLE NO. H-5

DATE 10/10/82 OPERATOR AS

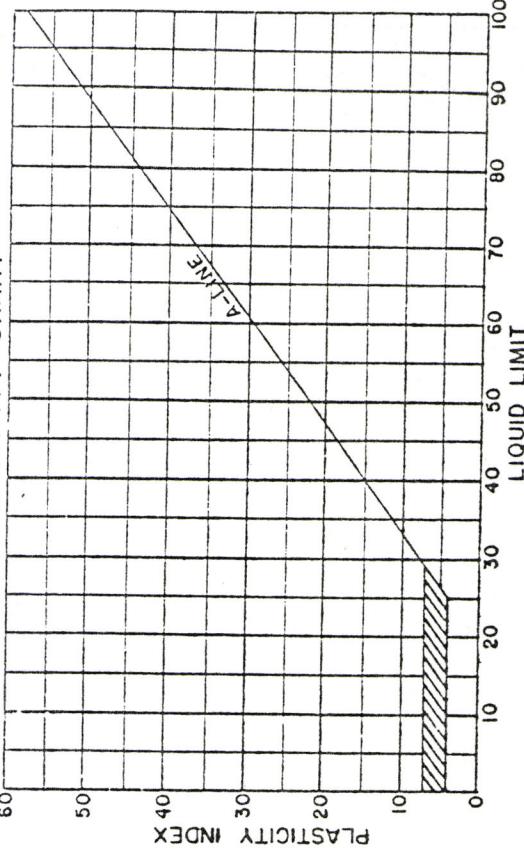
SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRYED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS		✓	

DESCRIPTION: *Moist, Grey gravelly, V. Silty, F-c Sand*

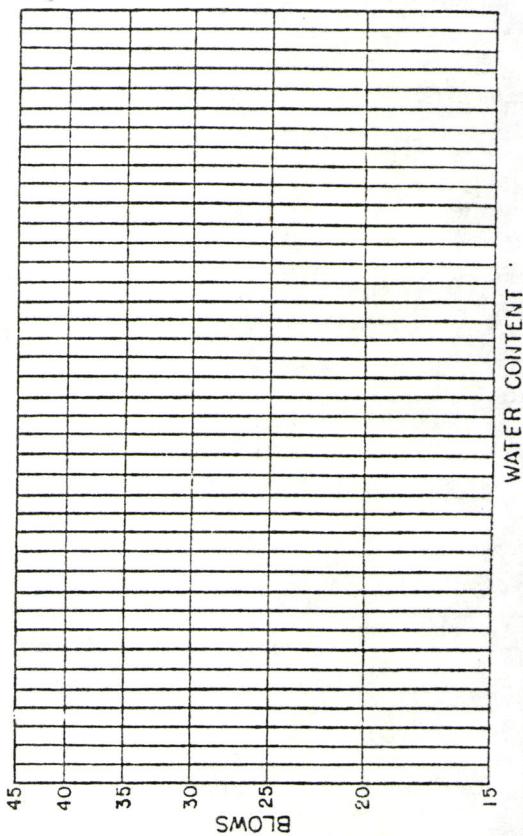


PLASTICITY CHART



LIQUID LIMIT DETERMINATION

	LIQUID LIMIT	PLASTIC LIMIT
Can No.		
Wet Wt.		
Dry Wt.		
% H ₂ O		PL =
Blows		PL =



WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAMPLE NO. 4257-3 JOB NO. DATE 10/10/83

HOLE NO. H-5 OPERATOR A-5

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRIED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	

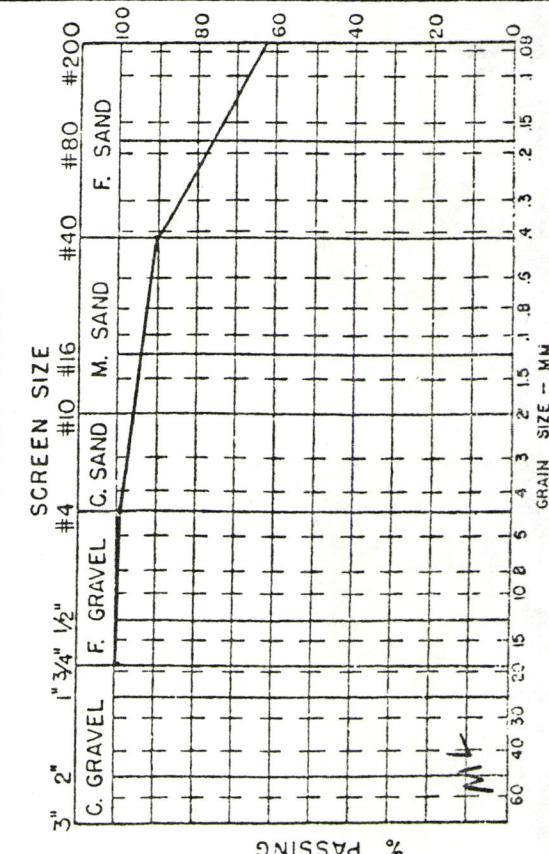
DESCRIPTION: Wet, Brown - Grey,
E.C. Sandy Silt w/ Trace of
F. gravel

21.25 25.20 183.35

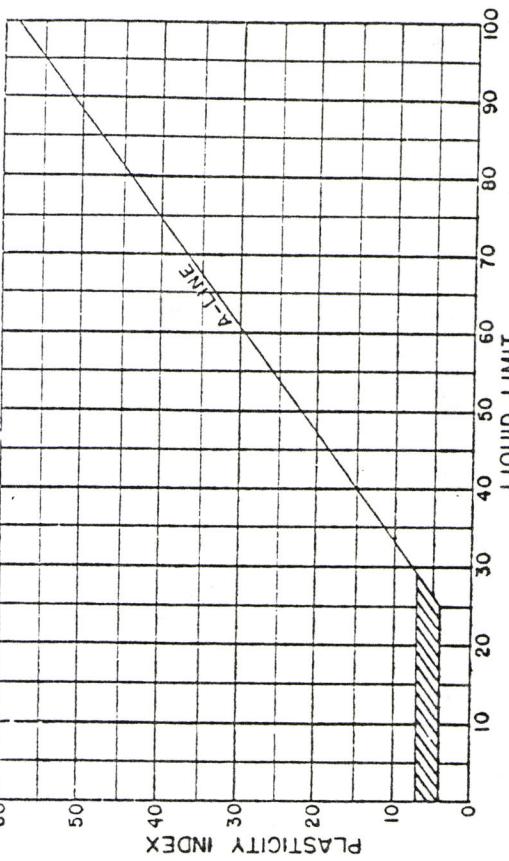
SIEVE ANALYSIS % Passing

-3/4 0.75	100%	80
-4 5.35	99.4	140
-10 11.22	96.7	200

GRAIN SIZE CURVE

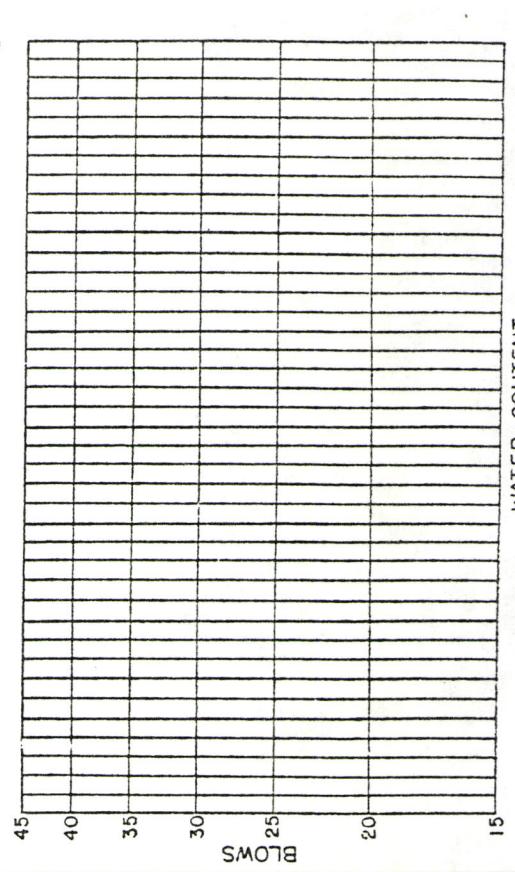


PLASTICITY CHART



LIQUID LIMIT DETERMINATION

Can No.	Wet Wt.	Dry Wt.	% H ₂ O	Blows	PL =	PI =



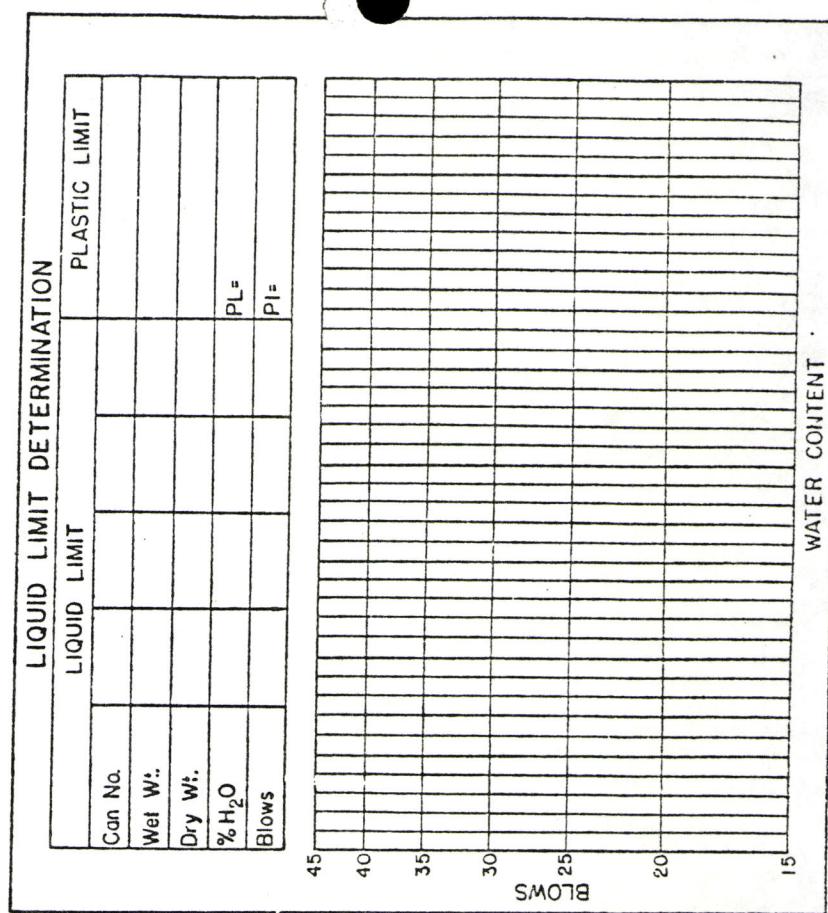
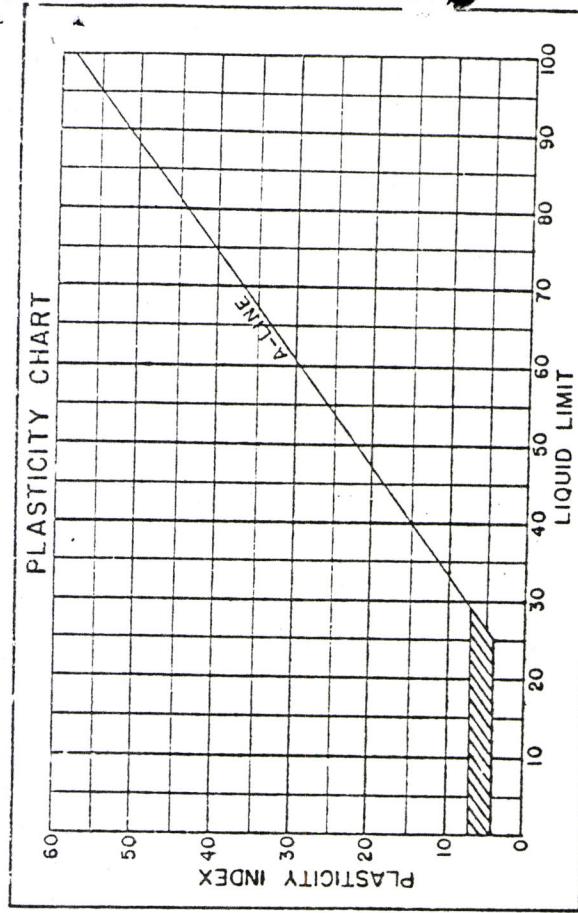
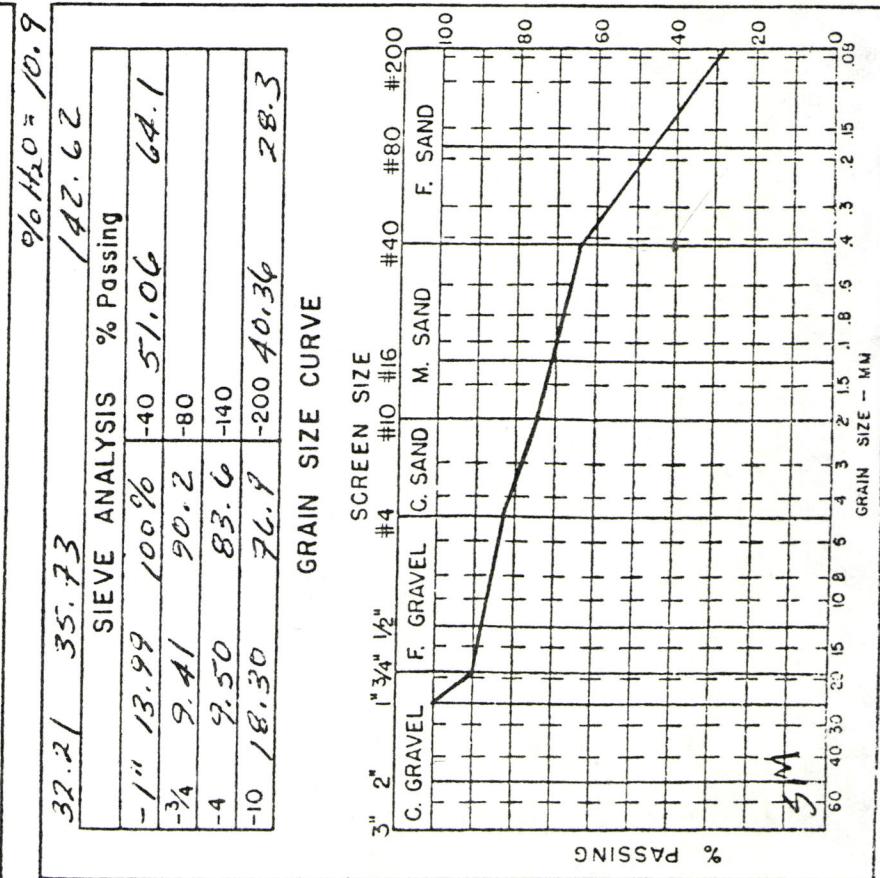
WATER CONTENT

SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

SAMPLE NO. 4957-4 JOB NO. H-5
DATE 10/10/83 OPERATOR AS

S011 EIEI IDENTIFICATION

TEST	SAND	SILT	CLAY
VISUAL	✓	✓	
DRYED CAST	✓	✓	
DILATANCY			
BITE			
TOUGHNESS	✓	✓	
DESCRIPTION:	Moist, Gray, 1" (-) S.R., Very Silty, F-c Sand		

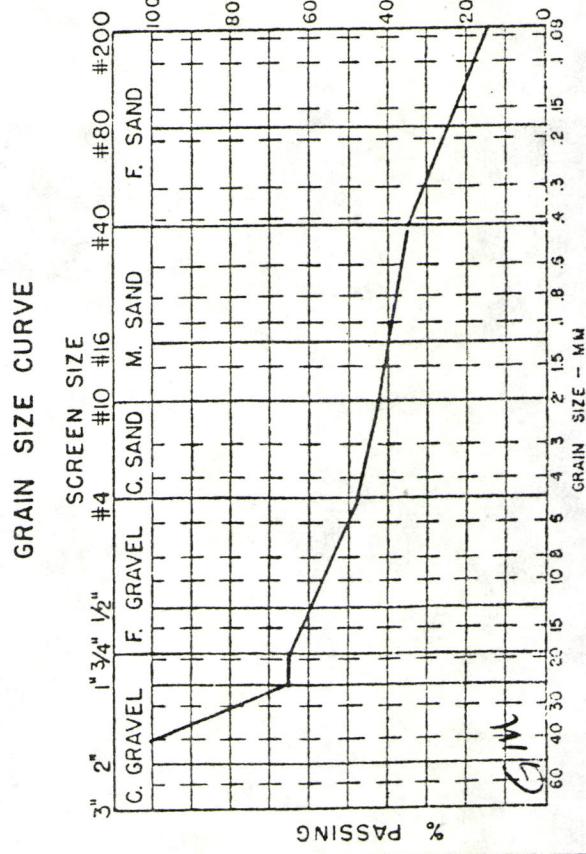
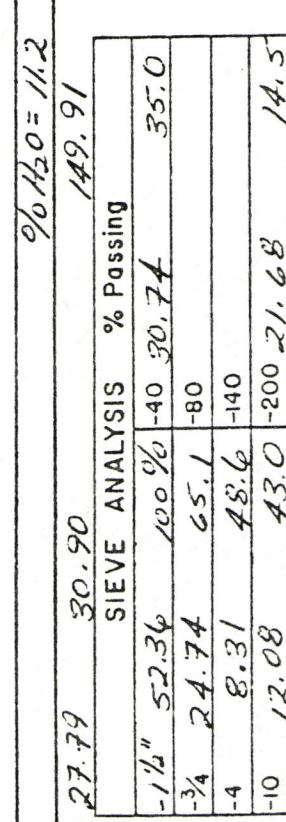


SOIL CLASSIFICATION AND IDENTIFICATION WORKSHEET

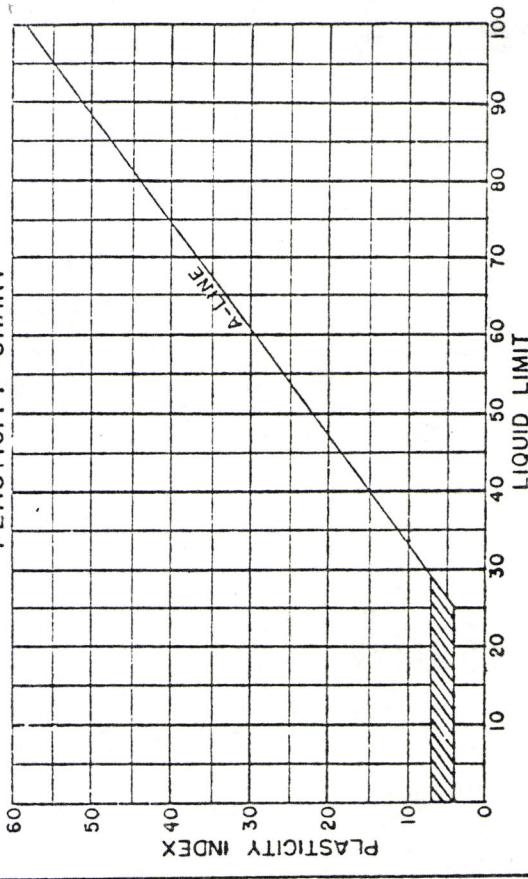
SAMPLE NO. 4957-4 JOB NO. H-5
DATE 10/10/83 OPERATOR AS

SOIL FIELD IDENTIFICATION

TEST	SAND	SILT	TOUGHNESS
CLAY			✓
DILATANCY			
DRYED CAST	✓	✓	
VISUAL	✓	✓	
BITE			



ELASTICITY CHART



WOUND LIMIT DETERMINATION

	Liquid Limit	Plastic Limit
Can No.		
Wet Wt.		
Dry Wt.		
% H ₂ O		PL =
Blows		PI =

